Manual of Stationery, Office Machines and Equipment

Edited by F.G.Holliday

11/-

The "Retail Stationer's Handbook" which was first published in 1930 achieved a reputation both in this country and abroad as an invaluable book of reference and as the textbook for the examinations of the British Stationery and Office Equipment Association.

Now it has been completely revised and given the new title of the **"Manual of Stationery, Office Machines and Equipment".** and good though the old Handbook was, this Manual which replaces it is a much better book in every way.

It is the most comprehensive publication on Stationery, Office Machines and Equipment ever written, and covers everything sold by the stationer and office equipment dealer.

Under the editorship of Mr. F. G. Holliday, a Director of the well-known firm of Stanford & Mann Ltd. of Birmingham, and a past Chairman of the British Stationery and Office Equipment Association, every individual section of the Manual has been written or approved by experts. Great care has been taken to ensure that all the references in the book are technically accurate and thoroughly up-to-date, and the advice, assistance and information provided by so many firms and individuals in the industry has been quite extraordinary.

The Manual is a "must" for every stationer and office equipment dealer.

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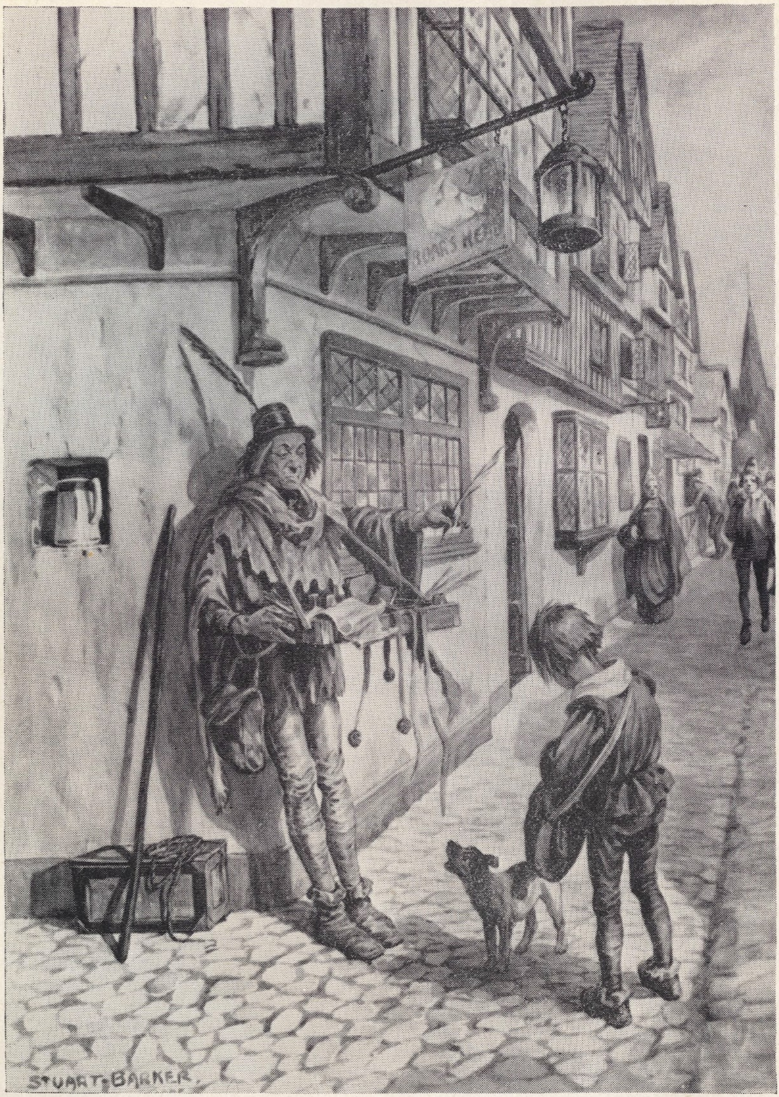
BOAR'S HEAD
STUART BARKER.

Manual of Stationery, Office Machines and Equipment

Edited by F. G. Holliday

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The British Stationery & Office Equipment Association
6 Wimpole Street, London W1

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WITHDRAWN FROM
CIRCULATION

Printed in Great Britain by W Heffer & Sons Ltd, Cambridge

Preface

As the title suggests, this is the most comprehensive book ever written on Stationery, Office Machinery and Equipment. It covers everything sold by the Stationery and Office Equipment Dealer and most of the more sophisticated systems, machines and equipment, which although not sold by the stationer or dealer, are essential for modern business operations. It will be invaluable in all forms of staff training.

All actively engaged in the stationery and office equipment industry, must have a copy of this manual and, it should also find a place in the offices of commerce, industry and those members of the public who purchase products in this field. Large or small, whether they use computers or bound account books—both of which are dealt with—the business community will find that the manual fills a real need. It is a veritable vade-mecum for the industry and its customers.

Both before, and during the time the student is having practical experience in the stationer's shop or office equipment dealer's showroom, he will be enabled to acquire a great fund of knowledge of all aspects of a trade which is fast becoming so much more interesting and exciting.

The entire industry owes a deep debt of gratitude to Mr. F. G. Holliday, a past Chairman of Council of this Association, who as editor, has had the enormous task of preparing this book much of which he has written personally. Originally, he set out to revise the old *Retail Stationer's Handbook*, but as he did, so the book gradually evolved into something much bigger and I think I can claim that there is no more comprehensive a volume on the industry, anywhere in the world. Mr. Holliday has sought expert help from many firms in the various sections which this book covers and they have responded magnificently with advice and assistance. Nevertheless, his has been the job of co-ordinating all this material in order to present it comprehensively and in readable form. He has suffered many setbacks and frustrations and I think it is true to say, that had he realized at the outset all the work entailed, he would have had second thoughts upon the task.

This manual is something of which both he and the trade can be proud.

PHILIP J. PULLINGER,
President, B.S.O.E.A.
1962/64 and 1968/69.

Acknowledgements

This manual replaces the *Retail Stationer's Handbook* which was first issued in January, 1930, and revised in 1949. Its preparation has been a task of some magnitude, and the following acknowledgements are gratefully made.

1. Contributors

The publication has been made possible only by the considerable help and technical advice received from companies within the industry. Major assistance has been in connexion with text, but of no less value has been the help with photographs, drawings and blocks.

In view of the many changes that have taken place in the industry, and the continuing technological advances, many new chapters have been included which did not appear in the *Retail Stationer's Handbook*. Some of these chapters cover equipment not generally available directly through the trade. The companies concerned, however, have been most helpful in providing information and illustrations, which, together with the other subjects, have enabled the production of a comprehensive work of reference covering the stationery, office machines and equipment industry as a whole. This will be of enormous value and interest to all who make, sell and use these products, although some subjects have not been covered exhaustively.

The names of the individuals and companies providing information, data, copy and illustrations from which the various chapters were compiled, to whom sincere thanks and appreciation are here recorded, are as follows:—

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2. British Standards Institution

Grateful acknowledgement is also made to the British Standards Institution, 2 Park Street, London, W.1, for permission to reproduce the whole, or extracts of, those Standards which it was felt, would increase the value and interest of the volume.

Much of the current work which B.S.I. is undertaking, is being related to the decisions of the International Organization for Standardization. Some standards already reflect decisions reached at international level and it seems probable that this will apply to an even greater extent in future standards in the field of stationery, printing, office equipment and machines, and data processing.

3. General Post Office

Appreciation is also recorded to the General Post Office for permission to reproduce certain sections from the *Post Office Guide* and for assistance given in respect of the chapter covering telecommunications.

4. W. Heffer & Sons Ltd.

Owing to the nature of the work and the time involved in its production, the printers have not had an easy task. In addition, the demands made upon them in one respect and another have been considerable. Their co-operation and assistance, which have been far beyond the normal "customer/printer" relationship, have been most generous.

5. Sub-Editor and Secretarial Staff

Special thanks and appreciation are recorded to the late Mr. E. G. Wallace, F.C.I.S., former Assistant Secretary of the Chartered Institute of Secretaries, who died before completion of his work. He rendered invaluable service with sub-editing, proof-reading and editorial advice. Additional thanks and appreciation are due to W. Heffer & Sons Ltd., who undertook completion of the sub-editing.

Secretarial work has been in the hands of Mrs. P. Hedley (B.S.O.E.A.) and Mrs. G. Morris (Stanford & Mann Ltd.). This has been faultless in execution and they have been unstinting with their time, labour and patience. Without them, this work would have been much more laborious, and I am deeply grateful for their efforts.

6. In Conclusion

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Business friends throughout the country, from whom I have sought help and advice; my family and personal friends, who, during the time I have been involved with this work, have exercised enormous patience with my pre-occupation.

Finally, I may be permitted to offer apologies in advance, for any errors or omissions. Considerable endeavour has been made to ensure that this manual is informative, factual, objective, technically accurate and up to date. However, in view of its scope, I am not a little apprehensive. Apart from this, I sincerely hope that the general information will serve the student and trade to some useful purpose—if so, I shall be well satisfied.

F. G. HOLLIDAY.

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Historical Introduction

The stationery trade can rightly claim its origin in the very earliest times, for as soon as Man acquired the ability to record his thoughts, and developed beyond the stage of the stone and chisel, so he required the materials for writing. The papyrus of the ancient Egyptians, the stylus, the reed, were but the early wares of the stationer and the predecessors of the modern note-paper and pen.

It can, too, claim an honourable and important place in the development of literature and culture. Until comparatively recent times, when printing was invented, all literature, all correspondence, all documents, and all business records had to be written by hand; it was not until 1535 that the first Bible was printed in English, and the most valuable printed work in the world, the copy of the Bible printed at the press set up by Gutenberg and Fust at Mainz, was produced as recently as 1452–56.

Yet for hundreds of years previously, all manner of history, laws, thought, hope and aspiration, had been recorded by hand: the mathematical propositions of Euclid; the philosophy of Aristotle, Plato and Socrates; the Magna Carta; even the manuscripts which enabled the Bible to be compiled—all these go to the root of modern literature and culture, and their preservation in permanent form, and their dissemination in the spread of knowledge, were made possible by the materials which led to the establishment of the stationery trade as it is to-day.

No trade, not even that of the booksellers, can claim a closer identity with the development of civilization, for essentially the stationer provided the paper, the pens and the writing fluid for the production of the book.

The word "stationer," which, according to Murray's English Dictionary, has been spelt variously "statiner," "stacyener," "stacyonere," "stacioner," and "stacyoner," derives in mediaeval Latin from "a tradesman (chiefly a bookseller) who has a station or shop, as distinguished from an itinerant vendor." Similarly, in early Spanish there was the word "*estacionario*," meaning "bookseller," and in Italian "*stazioniere*," meaning "shopkeeper."

Some years ago, the late Mr. Leonard Lydall, who was Chairman of the Council of the Stationers' Association of Great Britain and Ireland, 1925–26, researched into the origin of the term "stationer." He found that early in the fifteenth century it was the custom for pedlars to sell writing materials in the streets of the City of London, notably in Cheapside and the vicinity. While some hawked their wares further afield, others were licensed to remain stationary in appointed places. He had this impression depicted by an artist, and a copy of the painting appears as the frontispiece to this volume.

The term, however, would appear to date back further than the fifteenth century, for it was used in literature in 1262. The direct adoption of the Latin word was nevertheless evidently brought about exactly as Mr. Lydall surmised, though records at the British Museum indicate that the first traders to keep regular "stations" or shops were at the universities rather than in London. The "stationarius," or bookseller, who sold writing materials, was licensed and controlled by the academic authorities, whom he was sworn to obey. This seems to be logical enough, for the universities were the seats of learning, and writing in early times was the accomplishment only of the clergy, scholars, and some of the aristocracy—many Kings of England have been unable to read and write.

In 1612, in Rowland's *Knaue of Harts*, there is mention of the stationer:

"I grieue thou a groate to buy this Booke
I hate the Printer if he haue done well,
And Stationer, that doth these humours sell."

And again in 1680, Samuel Butler, the poet, wrote:

"Thy Works . . . never have been known to stand in need
Of Stationer to sell or Sot to read."

The earliest classification of the scope of the stationery trade appears to have been given by a man called Blount in 1656:

> " 'Stationer' is often confounded with 'bookseller' and sometimes with 'book-binder,' whereas they are three several trades. The stationer sells paper and paper books, ink, wax, etc. The bookseller deals only in printed books, ready bound. And the book-binder binds them, and sells not. But all three are of the Company of Stationers."

At this time the Worshipful Company of Stationers had been incorporated as a Livery Guild for exactly 100 years. It was founded in the early part of the fifteenth century, about 1403 or earlier, for the protection of merchants and vendors of books. The membership of the Company was limited to those engaged in the business of a "stationer"—*i.e.*, printer, publisher, bookseller, papermaker, or a cognate trade—and to their sons born after their fathers became freemen of the Company. This qualification was extended in 1933 to include newspaper makers, and the Company is now the Worshipful Company of Stationers and Newspaper Makers.

The Company wielded considerable influence and undoubtedly prevented many nefarious practices. At the same time the control it exercised brought about ethical methods of trading and protective legislation. The Charter granted to the Company enabled it to repress literature distasteful to the Court and ecclesiastical authorities, and no book or pamphlet could be printed unless it was licensed. This led to many unlicensed books being burnt at Stationers' Hall.

In recent years the control of the City Livery Companies over their respective trades has largely ceased to operate, and their influence is mainly limited to the exercise of certain civic functions within the City of London, the administration of charitable trusts committed to their care, the encouragement of education, and hospitality.

In their place have grown up trade associations, and so, in 1905, the Stationers' Association of Great Britain and Ireland was formed:

(1) To create and foster a permanent feeling of friendship and fraternity between the various sections of the stationery trade; to promote friendliness of spirit between competitors, and to strive for such aims and purposes as may be for the general advantage and benefit of its members and the trade as a whole.

(2) To discourage indiscriminate price-cutting in the retail trade and by means of price maintenance to abolish entirely the practice of using well-known proprietary articles as baits to attract custom.

(3) To ensure that in promoting the welfare of the trade the best interests of the public are also served.

Since then the trade of the stationer has expanded enormously. Originally he may have been the purveyor of note-paper and writing instruments, but, as the supplier to the whole field of communications he is, in many cases, today the complete office furnisher, able and willing to advise the largest commercial undertaking on the whole of its office installation from the interior decoration, the provision of desks, chairs, machines, systems, letter headings, right down to the pins and paper clips which are just as fundamental as ever to office efficiency.

It was for this reason that the Stationers' Association of Great Britain and Ireland decided in 1966 to change its name to the BRITISH STATIONERY AND OFFICE EQUIPMENT ASSOCIATION. This did not, in any sense, imply an extension of activity, for the organization has always concerned itself with office equipment and has always numbered manufacturers and distributors of this class of merchandise in its membership, but the fact had to be faced that, in the eyes of the public, stationery was frequently regarded as covering note-paper, envelopes, pens, and precious little else. The change of name was to describe the trade of the stationer more exactly in modern idiom, and this it was felt would be achieved by the addition of "office equipment."

But that, of course, is not the end of it, for in this mechanized age the stationer is now the supplier of stationery for computers and other data processing equipment, and he must always be concerned with the machines and the supplies which form part of the constantly growing "communications industry."

Part I

The first chapter of this book endeavours to familiarize the assistant with retail distribution and the functions and routines that are a necessary part of shop work as a whole. This is followed by three chapters dealing with merchandise of a social or personal character. The last chapter in this section covers the multitude of items that collectively are often referred to as "stationers' sundries". Most of them are used commercially, although some items are for personal use as well, but all form an important section of the stationer's stock.

This part of the handbook is used for the Preliminary Grade examinations of the Association.

Chapter 1. Elementary Retailing
" 2. Social and Household Stationery
" 3. Writing Instruments
" 4. Leather Goods
" 5. Stationers' Sundries

CHAPTER 1

Elementary Retailing

1. Elements of Business

Commerce

This is not intended to be a volume dealing in any sense with economics, yet by the very nature of things those who are engaged in the stationery trade are units in the economic system, and it may be of some interest at the outset to pause and consider just where retail distribution fits in.

The first thing to realize is that money, as such, is of no value; it is simply a medium of exchange, and useful only as a means of satisfying the needs of life, providing food, clothing, shelter, comforts and luxuries. Man works in order to fulfil these requirements, and that is the reason for the production of goods and for the attendant commercial operations in the normal activities of daily life.

But as, on the one hand, there is the production of goods, so on the other there is the consumption of them. These forces are constantly at work, one producing utilities in order to satisfy man's needs, and the other consuming them as those needs are met.

Commerce is the link between the producer and the consumer; it brings the two sides into relationship, and it is here that retail distribution becomes involved.

Broadly speaking, commerce divides under the following headings:

(*a*) Trade—which further subdivides into home trade and foreign trade, but in the present instance the latter will be disregarded;

(*b*) Transport;

(*c*) Banking;

(*d*) Insurance.

Trade and Distribution

This is simply the buying and selling of goods. In the days when man produced only in order to barter to fulfil his needs, there was no trade in the normal sense, but, as labour came to be divided, and men specialized in producing things according to their particular ability, so money came along as a medium of exchange, and men had to find a method of disposing of their products.

Here then was the first definite classification of manufacturers and distributors.

The manufacturer, however, has three distinct methods of distribution:

(*a*) by setting up his own organization and selling direct to the consumer;

(*b*) by selling to a wholesale merchant, who in turn sells to the retailer; or

(*c*) by selling direct to the retailer, who disposes of the goods to the public.

The function of the wholesaler in distribution is to buy in bulk from the manufacturer, to break his purchase down into smaller units and to re-sell to the retailer. He has the added, and most important, function of warehousing. Since production is carried on largely in anticipation of demand, goods frequently have to be stored until they are required: this is particularly so in the case of seasonal goods. Some manufacturers warehouse their own goods, but to a large extent this is done by the wholesaler, and warehousing is an essential element in commerce to ensure the even flow of trade and prevent fluctuation in supply and demand.

The retailer is concerned with selling in small quantities direct to the public.

He is a vital link in the chain of commerce, for he is the person through whom the consumer finally satisfies his needs. He is the one person through whom everyone, regardless of profession or business, comes into contact with commerce. His buying, his method of stocking, his presentation of merchandise, his service, his salesmanship, may well determine whether the needs of the consumer are satisfied, and at the same time whether any particular product of manufacture is to be a success on the market.

The retailer, in stocking a range of goods, provides the consumer with an easy means of purchase and a choice from which to make his selection; with his knowledge of local taste and quantity requirements he is able to guide the manufacturer in production, both as to the type of articles and the volume of them.

Thus he stands between the producer (though often directly separated from him by the wholesaler) and the consumer, and he justifies his position by his services to both sides and his efficiency as a distributing outlet to the public.

Transport

This provides the means for the physical transference of goods from manufacturer to distributor, and from distributor to consumer. All methods of transport render a service in the process of distribution and they enable the difficulties of distance between producer and consumer to be overcome. Without it, trade would be possible on a local scale only, and there would be no such thing as foreign trade.

Banking

Banks render a special commercial service by:

- (*a*) facilitating the payment for goods by means of cheques and other credit instruments, so enabling producers and consumers many miles apart to settle their indebtedness;
- (*b*) financing business operations by lending money at interest;
- (*c*) receiving deposits of money;
- (*d*) providing credit reference information;
- (*e*) investing money on account of their customers, and holding securities for safe custody; and
- (*f*) generally affording assistance and advice on matters of finance.

Insurance

This enables individuals collectively to safeguard themselves against contingencies such as fire, burglary, damage to goods in transit, etc., the happening of any one of which might otherwise fall so hardly on a single firm as to cause it to go out of business.

These, briefly, are the elements of business, and it is hoped that this outline will indicate their link with retail distribution, and demonstrate the importance of it in the economic system.

2. Scope of the Stationery and Office Equipment Trade

Distributive Outlets

Having considered retail distribution generally, a word must be said about the stationery and office equipment trade in particular. Its merchandise initially was sold through shops specializing purely and simply in paper, writing materials, etc. However, with the growth of printing, an industry closely allied to stationery, the stationer found the need to install his own printing press or to make arrangements with a printer to satisfy the needs of commerce and industry. Thus the "printer and stationer" became established. Very often it was a family business, but the owners were master tradesmen and it was upon their efforts that the trade as we know it to-day was built up.

Expansion of business, economic trends, and the like meant, in due course, changes in the general pattern of distribution. Small department stores came into being, then larger ones. Chain stores and multiple concerns began to spread throughout the country and these concerns found that they could sell selected items of stationery profitably. At first it was just one or two lines with a wide enough appeal that could be sold from any counter. Soon there were sufficient lines to make a stationery counter. Then it was but a short step to a stationery department.

More recently have come the birth and growth of supermarkets, self-service and self-selection stores, where the counter is replaced by large display stands dressed with large quantities of each item, priced individually, and customers are encouraged to serve themselves, paying for all their purchases at one "check out" point. This type of selling has demanded considerable changes in siting and layout of shops, presentation and display, etc. It has also meant a revision of the generally accepted customs, practices and methods in operation not so very long ago.

However, despite this competition, the stationer is still the specialist over the range of his products, as his competitors' stock is selective and primarily concerned with bulk sales. The ever-increasing demands of commerce and industry have caused the retail stationer to add office equipment and business machines to his stock, and to-day many retailers throughout the country are specialists in these fields.

The pattern of distribution is constantly changing and there is now a considerable development in mail order business, while the possibility of introducing the voluntary group principle into the stationery trade is also being examined.

Range of Merchandise

The choice of merchandise will largely depend on the type of shop and the class of trade the retailer wishes to develop. On the one hand there are the requirements of the industrial, commercial and professional communities, and on the other there are the social requirements and the domestic needs of the household. The stationer of today is very different from his forebears and may choose from an ever-increasing range of products. Broadly speaking, the choice may veer towards the social side, such as social and household stationery, greetings cards, etc., perhaps combined with bookselling, or, alternatively, towards office equipment, business machines, commercial stationery and print. In between, the range can extend to diaries, maps, artists' and drawing materials, leather goods, fancy goods, etc. Larger establishments will certainly cover the whole field of merchandise available. The choice having been made, it is then essential that the stockholding is sufficient to cover the demand within the limits of available capital and space.

Specialization

The expansion of the stationer's stock into this wider range of merchandise of course produces difficulties. More selling space and storage are needed. Larger premises mean higher rent, and probably more staff, which in turn means a higher wage bill. For many years overheads generally have increased. This is acceptable only if sales and profit margins increase also. Every business has to look closely at its costs and facilities in order to determine what changes might be more profitable.

Many shops have tended to sell an ever-widening range of goods in order to increase their sales. However, others have found it more expedient to reduce their range. The advancement of business systems, machines and equipment has meant that these sections of the trade as a whole have become trades in their own right, each demanding different techniques from the other. As a result there are now firms specializing in a particular type of product—*e.g.*, typewriters, office machinery, office furniture, etc. The latter even offer to design fittings and equipment right down to carpeting, curtains and other ancillary requirements of the modern office.

Sales Staff

In the same way that trade has altered, so indeed have the requirements and functions of the sales staff. The basic requirements of course remain. A successful salesman should have personality and be able to cultivate the right atmosphere between himself and the customer. Clothes, deportment and hygiene awareness are essential. Standards of speech, writing and spelling are also important, together with a reasonable knowledge of basic arithmetic such as multiplication, division, weights and measures, percentages, etc.

What has altered is the function and technique of selling. As an example, the sales approach in a self-selection or self-service store is quite different from that required where the assistant is separated from the customer by a counter. On the commercial side, machines and office equipment need to be demonstrated and their functions and possible use explained in some detail.

However, it is not the intention of this handbook to deal with the many factors in the art of selling. A more detailed exposition will be found in the companion volume *The Practice of Retailing*. What is essential at this stage is for the assistant to realize that there is more involved in selling than handing an article over the counter and receiving payment. The customer's requirements are many and varied and, as a result, knowledge of merchandise, whether superficial or in detail, is of paramount importance.

The study of merchandise is the principal objective of this book, and if this is grasped it will go a long way towards making selling more efficient, interesting and rewarding.

Training and Education

One of the main attributes of the sales assistant must be to have adequate knowledge of the commodity he is selling. This applies irrespective of the desire to specialize in a particular section or not, for the more extensive his knowledge is, the better the opportunity to improve his position. It cannot be too highly stressed therefore that the acquiring of such knowledge through training as well as experience will stand the young assistant in good stead in the years to follow.

The questions of general knowledge and the basic requirements of retail distribution are dealt with by many educational establishments in the form of day-release classes, evening classes and so on. In large organizations such training may also be arranged by the employer, side by side with instruction on the merchandise of that particular company. In small and medium businesses, however, this is not always possible.

Commodity training may be obtained in several ways. Large organizations will have their own training courses. Certain trades in large centres are covered by courses run by local authorities. Some manufacturers arrange courses to which they invite retail customers to send their assistants. In the stationery trade, if the lack of numbers prevents the organization of courses through educational authorities, local Association branches often organize more informal evening classes. A correspondence course is also available, providing the students with the advantage of studying at home.

The basis of the stationery and office equipment trade's education scheme is this textbook, which covers two grades—Preliminary and Intermediate. Examinations are held every year and certificates are awarded to successful candidates. For the management student there is the Advanced Grade, the basis of which is a second textbook *The Practice of Retailing*. In this case successful examination candidates are awarded a Diploma Certificate. There is also an apprenticeship scheme approved by the Ministry of Labour and the Ministry of Education under a Joint Apprenticeship Council, and this ensures a thorough all-round training.

The Industrial Training Act of 1964 was introduced to increase and improve training and education facilities in all branches of trade, industry and commerce. Therefore the emphasis on staff training will be greater in the future than in the past.

Further details of these courses may be obtained from local branches of the Association or its Headquarters.

3. Elementary Shop Routine

The object of the following section is to give the young assistant an insight into what is going on around him in order that the business of retail selling may function. It is emphasized, firstly, that the subjects will only skim the surface and secondly that procedures and methods will vary from business to business. Nevertheless, in order that the inexperienced assistant may more quickly become a useful member of the staff he should at least understand general procedure. A convenient point at which to commence is that of purchasing stock.

Purchasing

In order that any type of retail outlet may function, the first task is to purchase the goods which it intends to sell. Since this involves the spending of capital—*i.e.*, money—it is important that it is spent to the best possible advantage and on the most suitable merchandise for the trade involved. This means that the control of purchasing is one of the most important aspects of shop routine. It is accomplished in many ways, and the following comments are intended to show some of the considerations that have to be taken into account:—

Stockkeeping and Control

The essential factor is to ensure that stock is always available when required. Customers do not like to be told "Sorry sir,—we are out of stock." The method may be quite simply a visual one, carried out at frequent intervals, or by some form of written record. In larger concerns machine recording can be employed. Stock must always be kept clean and tidy, and care taken to prevent damage. Old stock should always be brought forward when new stock arrives in order that it does not get too dirty, dusty or even out of date so as to become unsaleable. Faster-selling lines should be kept nearer to hand so that replenishment is more easily effected.

Stock Analysis and Turnover

Many similar lines are available from different suppliers, varying slightly in design, quality, price, etc. In addition the popularity of lines will differ, as will sales at certain times of the year. It is therefore important for the buyer to know as much as possible about the stock and its movement, in order to ensure that the correct quantities are bought at the right time, from the right supplier and at the most competitive price.

Turnover of stock is important because the more quickly stock is sold, the more quickly the purchase price will be recovered, plus the retailer's profit, thereby enabling capital—*i.e.*, money—to be used yet again to purchase further supplies. It is the aim of every business to "turn over" its stock as many times a year as possible. In other words, it is better to buy, say, one gross of an article four times a year than four gross once a year.

Purchase Records

In the same way that quantities of stock already purchased are controlled, so must be the actual purchases. However small the business, the number of lines stocked is considerable, and even people with good memories cannot possibly remember everything that is ordered. Records, therefore, are essential. They may be kept by classification of goods departmentally or perhaps by classifying suppliers. Again, the method can vary from the very simple to the highly elaborate. Whatever system is employed, it will enable the buyer to keep track of what is on order and in addition will assist in no small measure to build up a picture of the popularity or otherwise of any product. Furthermore, it is expedient to be able to cross-check when the goods are delivered.

Repeats and New Lines

Much of the purchasing will be in respect of established lines and is therefore called "repeat buying." The records mentioned in the preceding paragraph will help to decide what quantities are needed. However, from time to time suppliers will introduce new lines, or perhaps something not so new but completely redesigned or repacked. The buyer will then have to give consideration to its potential sale, price, advertising, promotion and so on. This is one of the more difficult tasks, as the buyer must endeavour to put himself in the position of a potential customer, looking at the product from the customer's viewpoint. New lines play an important part in keeping a business up to date, and it is most necessary for the assistant to find out all he can about the product to enable him to advise and, of course, to sell it to the customer.

Selective Buying

Although it is not used as a heading to this paragraph, another expression used with the same meaning is "rationalization." To some extent it is coupled up with stock analysis and purchase records. A look round almost any shop will show that many lines are sold for the same purpose. Stock takes up space, and both stock and space cost money. It has already been noted that the aim is to "turn round" stock as often as possible. Therefore if, for example, three lines are stocked all serving the same need, the "stock turn" will be improved if those lines can be reduced to two—or even a single item. Of course it is not quite as simple as this as many other factors have to be taken into consideration. However, once again the keeping of some sort of record already mentioned will assist in more selective buying of stock.

Advance Purchasing

This is sometimes called "forward purchasing" and very often relates to the buying of seasonal goods, or whenever there is need to look ahead. Christmas cards are a good example. They are sold over a short period of time: but the manufacturer needs time to produce and distribute and will therefore seek the retailer's order during the early part of the year. Another example is that of ordering educational stationery before the students go back to school.

Terms and Delivery

In the main there are two classes of "terms." The first refers to the price at which the retailer buys his stock (or the discount he is allowed off the selling price): these are known as "trade terms." The second is called "settlement terms." This is an amount that the retailer is allowed to deduct from his invoice, and is usually in the region of $1\frac{1}{4}$ to 5 per cent. This is an incentive for the retailer to pay for the goods promptly. If he does not, then the extra discount is not allowed and the invoice is called "net." A further reduction in the basic cost of the goods is very often "quantity rate terms," which means that the more the retailer buys, the less he will pay for each unit of his purchase.

The time taken for delivery should always be kept in mind as this will vary according to efficiency of the supplier, locality, demand, transport facilities, etc.

Special Purchasing

Up to now only the purchasing of goods for stock has been considered. There are other types of purchasing, and these fall into two categories.

Specially Ordered Stock Lines

It is quite impossible for any retailer to stock everything. There are, however, many instances when customers require goods that are not stocked and they will have to be ordered specially for that customer. The policy on this type of purchasing will be decided by the management, and the assistant must become familiar with it as soon as possible. Many factors, such as quantity, have to be taken into consideration, for some manufacturers will supply only minimum amounts. If the quantity required necessitates splitting parcels an extra charge may be incurred. There are packing and carriage charges to be taken into consideration and, not least, the general profitability of the item. Although a basic policy can be laid down, very often it is a question of experience as to whether a specific item or quantity can be obtained.

Specially Made Goods

These goods are sometimes called "bespoke" lines; very simply, they are goods specially manufactured to a customer's own specification. Those concerns catering for commercial and industrial requirements will deal with a fairly high proportion of this type of order. A large percentage of printing orders comes into this category and, at the other end of the scale, orders for specially made rubber stamps. At the outset clear and precise instructions must be obtained and an accurate specification must be sent to the supplier. The taking of such orders is usually handled by a responsible and experienced assistant, but it is imperative that all assistants become proficient in this respect. The study of this handbook will go a long way towards enabling them to attain this proficiency, although experience will eventually make the task of taking such orders much easier. As with normal stock, special orders can be divided into "new orders" and "repeat orders." The latter are usually simplified by the quoting of a special reference number allocated in the first instance, together with the keeping of patterns and the recording of the specification. Price and delivery, too, are important factors. The former will inevitably be higher than in the case of similar stock lines and the latter will take longer in manufacturing, and customers must be warned of this. For new orders they will invariably require price and delivery to be quoted first.

Purchase Orders

Before leaving the subject of purchasing, reference must be made to the order itself. The usual practice is for a specially designed order form to be used and this may be in duplicate or even triplicate: the copies are for reference and recording purposes. Clarity of the details is most important. Quantities and reference numbers or specification of the item being ordered should be as clear as possible. In addition, instructions concerning delivery, invoicing and the date on which the goods are required must also be stated. Some suppliers send acknowledgements of orders received, and these should be carefully checked against the copy order. It is also a good idea—particularly in the case of specially made goods—to check these orders periodically so as to ensure that delivery will be made on time. This is called "progressing the order."

Goods Inwards

The next stage is the receipt of the goods by the goods inwards department. In smaller companies this work may also be the responsibility of the department issuing the purchase order. In any case, the goods must be checked against the purchase order. Some suppliers will include a delivery note or advice note which details the items in the consignment. The invoice for the goods is sent by post and, once it is established that the goods received are correct, it is checked for pricing and extensions, and passed to the accounts office for payment. It may be the goods are for a special order, in which case the customer's order has to be priced from the supplier's invoice first.

A note must be made of shortages or any damaged goods, which are subsequently reported to the supplier for correction. If damage is obvious from the outside of the parcel, the carriers must be informed, so that a claim may be made against them.

Once an invoice or advice note is received from the supplier, delivery of the goods should follow, and care must be taken to ensure that they arrive within a stipulated time. Most suppliers allow about 14 days: if the goods do not arrive within this time, the fact must be reported to them so that investigation may be made. If the consignment cannot be traced, a claim against the carrier will be made by the supplier.

A record should be kept of all parcels received as, although a supplier may dispatch several parcels together, they will not always be received in one delivery. If damage to a parcel is apparent from outside, then the carrier's docket should be marked "damaged parcel" so as to support any claim made if the merchandise inside the parcel is also found to be damaged.

Such damages or shortages should be reported to the supplier by means of a debit note. A copy of this is sent to the accounts office for reference. The supplier will then either send replacements—in which case the debit note is cancelled—or a credit note. This will allow both the supplier and the shopkeeper to make adjustments to their ledger accounts. Similarly, incorrect goods should be returned with a debit note for exactly the same reason.

The goods, having been checked and priced, are then sent to the department or warehouse, or to the dispatch department if they are to be re-consigned to a customer.

Daily Routine of Sales Assistant

The stage has now been reached where the merchandise is available for resale, and the specific duties of the sales assistant can take place. While the most important task is to serve customers, other daily "chores" have to be attended to. Shelves and display fixtures need to be replenished with stock. The various articles have to be priced individually if they are not already priced by the supplier. Stock and displays have to be cleaned, dusted and tidied; soiled or damaged goods removed; lines out of stock or low in quantity must be reported. These routine tasks are best attended to as soon as possible in the morning, but also during the day if need be—but never to the detriment of serving the customer.

Sales Transactions

The manner in which customers pay for their purchases can be divided into two principal groups:—

Cash Transactions

The majority of customers purchase for cash at the time of the sale. The amount is rung up on the cash register, and every care must be taken to ensure that the correct amount is registered and correct change tendered to the customer. The type of register used can vary considerably. Some will automatically issue receipts, others will itemize certain classes of sales so that an analysis may be made at the end of the day. According to the size of shop, the registers may have individual keys allocated to each assistant so that an accurate record of sales per assistant may be made. At times customers will return goods and a refund of cash has to be made; this must be recorded. In many shops, refunds have to be dealt with by a supervisor or departmental head.

It is common practice today for payment to be made by cheque. Acceptance of payment in this manner will depend on the policy of the company—particularly where value is concerned. Amounts over a certain value may have to be referred to the accounts office before acceptance, and the rules of the management must be strictly observed.

In the case of special orders, some shops require a deposit to be paid. This is to ensure good faith on the customer's part, as the goods will be of no value to the shopkeeper if the customer fails to collect them when they are ready. Receipts and accurate recording of these deposits are essential to save argument when the sale is completed.

Sometimes goods are allowed to be purchased "on approval." This means that the customer may take the goods out of the shop for inspection and consideration as to whether they fulfil his requirements. Again reference will have to be made as to the integrity of the customer.

Credit Transactions

Where frequent purchases are made, and particularly in the case of purchases made by business houses, the method of payment is by means of a credit transaction. This is precisely the same way in which the shopkeeper buys his stock from his suppliers. The goods are invoiced to the customer and at the end of the month a "statement" is sent which details all the invoices and any moneys already received and shows a balance that is due to the shopkeeper.

Before accounts are opened, inquiries are made as to the financial standing and integrity of the customer. In spite of this care, however, there are instances when the customer fails to meet his obligations. Then, after "overdue reminders" have been sent, without result, the shopkeeper will need to take action to recover moneys owing.

Another type of transaction is by "*pro forma*" invoice. This occurs usually where the customer does not have an account but requires goods to be sent and charged. In this case an invoice is made out and headed "*pro forma*." The customer is then required to pay on receipt of the invoice, and, when he has done so, the goods are then dispatched.

The recording and keeping of credit transactions are dealt with by the accounts office and further reference to this will be made later on.

Customers' Orders

The correct recording of an order is a particularly important task of the assistant. It may well be that the customer presents—or sends by post—his requirements on an official order form, which does assist, though care must be taken with any instructions. Very often, however, orders are placed orally and the assistant will need to write out the order, using whatever method is adopted by the shopkeeper. Writing should be very clear—block lettering is advised. The following is a note of the important details to be stated:—

Full name and address.
Delivery address, if different.
Invoice address, if different.
Order number and department.
Telephone number and contact.
Details of goods required.

So far as the last point is concerned, the assistant should always try to quote a reference number of the article or alternatively ensure that the description is complete. For instance, "1 dozen notebooks" would be quite useless, as there are so many types of notebook. What size are they? Thickness? Ruling? Binding? Another example might be "1 dozen ball pens." One would need to know the make, model number, colour, etc. Nearly every commodity in the shop needs specific details.

Another point that the assistant should remember is the manner in which quantities and prices are expressed. As an example, "1 box of envelopes"; this does not convey the exact quantity, for they might be boxed in 250s, 500s or 1,000s. Similarly, the price should be expressed in the same manner as the quantity is given—*e.g.*, "6 only at 1s. ea." or "½ dozen at 12s. dozen."

Many orders may be placed over the telephone, and in this case even extra care and patience should be exercised, as not everyone's voice carries clearly. It is better to ask the customer to repeat what he has said than to take down incorrect details. A further question must be whether the order is to be paid for by cash or whether it is to be invoiced. If the latter, then confirmation from the accounts office should be obtained.

Some orders may well be for goods specially made or printed. In this event reference should be made to the question of price and delivery. It is very often wise to quote first, as this will save queries and argument at a later date. It is not really advisable to take orders for specials on the telephone but, if it is unavoidable, then they should be confirmed by the customer in writing. Should the order be given orally, then the customer might be asked to check the details.

Customers' Inquiries

Many customers, particularly in the commercial and industrial fields, want to know that they are buying their requirements competitively, particularly when quantities are required. This is done by asking the shopkeeper to quote. Then prices, quality, delivery periods, etc. are checked against those obtained from alternative sources. When specially made or printed goods are wanted the same procedure is carried out. While these inquiries are more often than not sent out by post, some will inevitably be dealt with by personal contact. The sales assistant therefore will be required to make a note of all the relevant details. Comments made in the previous section as to the taking of orders apply also to inquiries.

Goods Outwards

Although merchandise is bought in the shop, it has already been seen that other customers place orders for goods to be sent to them. The various items on the customer's order have to be drawn from the departmental stock or warehouse. They are then checked and packed for dispatch. An advice note or delivery note is made out detailing the items in the consignment to enable the customer to check. Packing is important, as parcels receive considerable handling in transit. Method of delivery may be by the company's own vehicle, a transport contractor or, of course, through parcel post. The order is then sent to the invoice section of the office, where an invoice is made out and sent to the customer. Sometimes it is possible to prepare the invoice and to send it with the goods, thereby avoiding the need for a delivery note.

The Office

Where a company is large enough, the office attends to all clerical and similar duties. In small concerns, however, these duties still have to be carried out, though by a smaller number of people or even by the shopkeeper himself. Broadly speaking, the work carried out can be divided into two main groups—accounting and administrative.

The accounts section will deal with all the book-keeping of the firm's accounts. This, too, may be divided into two principal categories. First, the sales ledger which relates to all the goods sold to customers. Secondly, the purchase ledger, which deals with all the goods purchased from suppliers. There may well be a cashier, wages clerk and others looking after various sections where money is concerned.

The administrative side will deal with all other clerical work. This can be broken down into many different units, dependent on the size of the company.

Departmentalization

The preceding paragraphs have endeavoured to set out basic shop practices and procedures necessary to produce a sale. It must be remembered, however, that the application and responsibilities will vary according to the type, and particularly the size, of the business. On the one hand there is the very small independent business, consisting of the proprietor and one or two assistants. In this case the entire work may well be the responsibility of the proprietor. Nevertheless, if his daily work was analysed, it would be found that each of his tasks would fit into one or the other of the headings previously described.

On the other hand a large organization would be departmentalized so that separate departments would be responsible for particular sections. For instance, there might be a purchasing department solely responsible for the buying of merchandise, a dispatch department solely responsible for the dispatch of the goods outwards, and so on. Alternatively, medium-sized businesses, unable to afford 100 per cent. departmentalization, will at least divide into sections covering two or three of the various responsibilities.

In every case, however, basic routines will be found, and it is with these that the student should at this stage be conversant, for without them chaos would exist. Once this has been learnt, the next step is to acquire knowledge of the articles that are sold in the stationery store or department, and these will be dealt with in the following chapters.

CHAPTER 2

Social and Household Stationery

Consideration will be given in this chapter to two sections of the trade which are quite distinct, and yet which are to some extent allied in that they are indispensable to every well-ordered household.

The first is social stationery, which comprises personal correspondence media, visiting cards, greeting cards, and all those many other items which are necessary for the maintenance of social relations, as it were, from the cradle—with the use of birth announcement cards—to the grave—with in memoriam stationery.

This is a most important class of business, for it covers such a wide range of goods. As in certain other cases, however, no useful purpose would be served by dealing at any length with processes of production, so the references in this chapter are confined to those particular aspects that are likely to be of use to the stationer and his assistant.

The second section, household stationery, covers those articles that are so invaluable to the housewife for table and kitchen use, and in the preparation and service of food. Here again, methods of manufacture are of lesser importance in a volume of this sort, so no explanation is given of them.

Both sections can be divided conveniently into well defined groups.

1. Personal Stationery

This is the recognized term for describing writing paper, correspondence cards and envelopes which are designed for personal correspondence and provides a convenient distinction from commercial stationery.

In the post-war years most manufacturers have concentrated on brand development which, supported by press, television and extensive point-of-sale publicity, brings with it all the advantages and rewards of national distribution and demand for both stationer and manufacturer alike.

Personal stationery is one of the most important ranges of the retailer's stock, and he and his assistants should be completely familiar with the range available to them. They should be able to advise on types of paper, sizes, colours and—particularly important—on die-engraved and printed headings.

A customer who has been satisfied with an order for writing paper will return when he needs other articles, for personal stationery is essentially *personal*, and it frequently forms a basis of a permanent and useful account for stationery items of every sort, both social and commercial.

Qualities

The manufacture of paper is fully covered in the appropriate chapter, and a section on classification deals with various qualities of notepapers. At this stage, however, the student should be aware of the broad classification which is based on the raw materials used. Commencing with the better quality, these are:—

High-class Writings: These are either all rag or mixture of rag and chemical wood pulp.

Woodfree Writings: These are made wholly from chemical wood pulp.

Wood Papers: These contain a large percentage of mechanical wood and a smaller percentage of chemical wood pulp.

Esparto Papers: These contain a percentage of chemical wood pulp.

These materials, together with the method of manufacture, give a wide range of qualities from which to choose. In addition there is the availability of varying substances, colours and finishes. Although they are not dealt with in detail in this chapter, it is important for the student to become familiar with the various qualities etc. as soon as possible, in order that he may sell more knowledgeably and efficiently.

Definitions

The British Standard definitions are as follows.

(*a*) *Personal stationery*. A term used in distinction from commercial stationery, and describing notepaper, writing pads, compendiums, cabinets, wallets, correspondence cards, postcards, and "letterettes" for personal correspondence.

(*b*) *Notepaper*. Writing paper cut or made to any of the standard sizes referred to in Table I. It can be in one of two forms:

(1) "Fly sheets," folded in half to produce two leaves (or four pages). The measurements given in Tables I and II refer to the face of the folded sheet, and not the sheet opened flat.

(2) "Single sheets," unfolded, providing one leaf (two pages).

(*c*) *Writing pad*. That form of personal stationery in which sheets are secured together along one edge with glue, latex, or by other means. The top sheet may be detached without disturbing the effectiveness of the binding of those still left in the pad. It is normal practice to bind the shorter edge unless otherwise specified.

The term "sheets" is used to describe notepaper or the contents of writing pads. The terms "leaves" and "pages" are not recommended.

(*d*) *Cabinet*. That form of personal stationery in which a writing pad or notepaper, and envelopes, are together included in a single box.

(*e*) *Compendium.* That form of personal stationery in which a writing pad or notepaper, and envelopes, are together provided in a stiff folder.

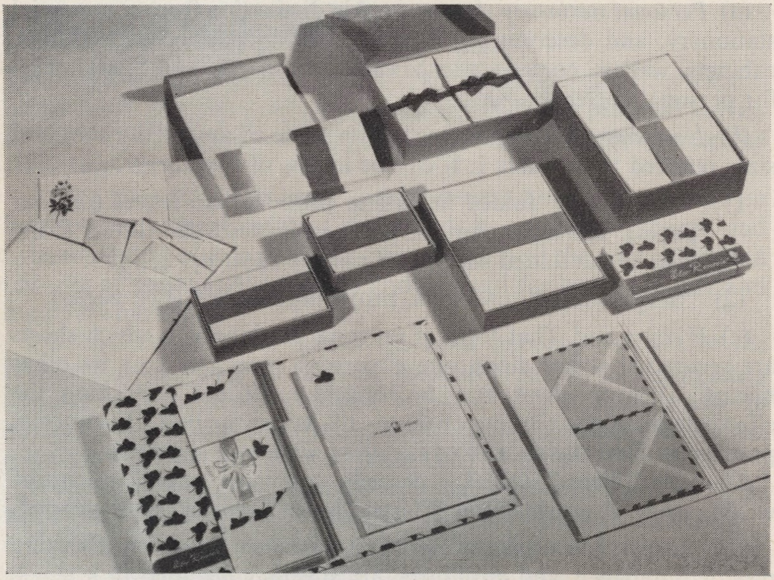
(*f*) *Wallet.* That form of personal stationery in which a writing pad or notepaper, and envelopes, are together provided in a limp folder.

(*g*) *Packet.* That form of personal stationery in which notepaper and envelopes are together included in a paper cover, generally in the form of an outer envelope.

(*h*) *Correspondence card.* That form of personal stationery composed of boards of caliper not less than 0·010 in. (0·25 mm.) enclosed in matching envelopes.

(*j*) *Postcard.* That form of personal stationery composed of boards which, to comply with Post Office regulations, must be of caliper not less than 0·010 in. (0·25 mm.) and not more flexible than those sold by the Post Office.

NOTE. The minimum size which may be sent through the post to qualify for postcard rate is 2¾ in. × 4 in. (70 mm. × 101 mm.)—after July 1968 it will be 3½ in. × 5½ in. (89 mm. × 140 mm.)—and the maximum size 4⅛ in. × 5⅞ in. (105 mm. × 150 mm.). A postcard when sent through the post may not be folded, fastened against inspection in any way or enclosed in a cover of any kind if sent at the postcard rate; at least the right-hand half of the address side must be reserved exclusively for the address and postage stamps.



Personal Stationery.

TABLE 1. NOTEPAPER, PAD, ENVELOPE AND CORRESPONDENCE CARD SIZES

(BRITISH SIZES)

Name of size	Notepaper and pads		Direction and number of folds (if folded)	Envelopes		Name of size	Direction and number of folds if folded	Long envelopes		Correspondence cards	
	in.	mm.		in.	mm.			in.	mm.	in.	mm.
Albert	6×4	152×102	Once parallel to shorter side	3¼×4¼	83×108	Albert					
Post Octavo	7×4½	178×114	Once parallel to shorter side	3¾×4¾	95×121	Post Octavo				3½×4½	89×114
Duke	7×5⅜	178×137	Once parallel to shorter side	3¾×5¾*	95×146	Duke				3½×5½	89×140
Large Post Octavo	8×5	203×127	Once parallel to shorter side	4¼×5¼	108×133	Large Post Octavo				4 ×5	102×127
Albert Quarto	8×6	203×152	Once parallel to shorter side	4¼×6¼*	108×159	Albert Quarto					
Duchess Quarto	9×6	229×152				Duchess Quarto	Twice parallel to shorter side	3¼×6¼	83×159		
Post Quarto	9×7	229×178	Twice at right angles	3¾×4¾	95×121	Post Quarto	Twice parallel to shorter side	3¼×7¼†	83×184		
Large Post Quarto	10×8	254×203	Twice at right angles	4¼×5¼	108×133	Large Post Quarto	Twice parallel to shorter side	4 ×9*	102×229		

* These envelope sizes will conform with the POP regulations to be introduced in July, 1968

† This size does not conform with the POP regulations, but will do so if increased to 3½ × 7⅞ in. (89 × 187mm).

TABLE II. INTERNATIONAL STANDARD
NOTEPAPER, PAD, CORRESPONDENCE CARD AND ENVELOPE SIZES
(METRIC SIZES)

Designation	Size of notepaper and pad		How folded	Designation of envelope	Envelopes		Designation	How folded	Designation of envelope	Long envelope		Correspondence cards	
	mm.	in.			mm.	in.				mm.	in.	mm.	in.
A7	74×105	2·91× 4·13	Not folded	C7	81×114	3·19× 4·49	A7					74×105	2·91×4·13
A6	105×148	4·13× 5·83	Not folded	C6*	114×162	4·49× 6·38	A6					105×148	4·13×5·83
			Once parallel to shorter side=A7	C7	81×114	3·19× 4·49							
A5	148×210	5·83× 8·27	Not folded	C5	162×229	6·38× 9·02	A5						
			Once parallel to shorter side=A6	C6*	114×162	4·49× 6·38		Once parallel to longer side =¼A4	D.L.*	110×220	4·33× 8·66		
			Twice at right angles =A7	C7	81×114	3·19× 4·49		Twice parallel to shorter side =⅓A5	C7/6	81×162	3·19×6·38		
A4	210×297	8·27×11·69	Not folded	C4	239×324	9·02×12·76	A4						
			Once parallel to shorter side =A5	C5	162×229	6·38× 9·02		Once parallel to longer side=¼A3	B6/C4	125×324	4·92×12·76		
			Twice at right angles =A6	C6*	114×162	4·49× 6·38		Twice parallel to shorter side =⅓A4	D.L.*	110×220	4·33× 8·66		

NOTE. The notepaper, pad and card sizes have been taken from B.S. "Printed matter and stationery. A and B series of trimmed sizes." The envelope sizes have been taken from an appendix in B.S. "Commercial envelopes (terms and sizes)".

* These envelope sizes will conform with the POP regulations to be introduced in July, 1968

Forms of Packing and Presentation

Personal writing paper for everyday use is produced in four basic forms.

1. (1) Writing pads with packets of matching envelopes.
2. (2) Boxes usually containing 200 single or 100 double (fly) sheets and separate boxes of 80 or 100 matching envelopes.
3. (3) Portfolios containing a writing pad with a supply of matching envelopes.
4. (4) Boxes generally known as cabinets, containing varying quantities of writing paper with matching envelopes.

The most popular form of all is the writing pad with matching envelopes in packets.

Separately boxed writing paper and envelopes are obviously a more costly purchase, but have the advantage of providing the household with a bulk supply of stationery. Writing paper purchased in this form is ideal for personalizing with a die-engraved or printed address and telephone number.

Gift Stationery

Gift stationery almost invariably comes in cabinet or portfolio form and today enjoys a year-round demand. Personal stationery, like many other things, is subject to the whims of fashion, and this is especially apparent in the presentation of gift stationery packs.

Beautifully designed boxes and portfolio covers, ribbon-tied writing paper and colourful tissue-lined envelopes combine to produce an annual profusion of attractive gift packs which form an important part of the stationer's trade.

Notelets/Brieflets/Letterettes

As the term implies, this is a form of personal stationery designed for a short note. More often than not a notelet consists of a four-fold or fly sheet of writing paper printed with an attractive design on the face and packed in cabinet or wallet form with the appropriate number of matching envelopes.

A vast range is available for the stationer's selection, and it represents a personal stationery form which in recent years has achieved immense popularity.

Contents, Ordering and Pricing

The following are the British Standard requirements in respect of the quoting of contents of certain items and units for ordering and pricing.

(*a*) The order for quoting the contents of compendiums, wallets, cabinets and packets shall be first the number of sheets of notepaper or pad and second the number of envelopes—*e.g.*, "60/40 wallet" is a wallet containing 60 sheets of notepaper and 40 envelopes.

"12/10 packet" is a packet containing 12 sheets of notepaper and 10 envelopes.

NOTE. To meet the requirements of the Merchandise Act 1963 the item must be stated after the quantity—*e.g.*, 60 sheets/40 envelopes.

(*b*) The units for ordering and pricing notepaper, writing pads, cabinets, compendiums, wallets, pads, cards and envelopes shall be:

Single unit—*i.e.*, one cabinet
Dozen units
Gross units

Notepaper, envelopes and cards sold in bulk (*i.e.*, not in packed units) may be ordered or priced per thousand.

NOTE. This limitation of recognized units purposely avoids the inclusion of reams, cut reams, folio reams, etc., since these terms lead to confusion.

Sizes

Generally speaking, the manufacture of writing paper is confined to those sizes which come within the specification of the British Standards Institution and which are detailed under a separate heading.

These have proved readily acceptable to the greater proportion of the British letter-writing public, but it is worth noting that the four sizes listed below are predominantly the most popular.

Writing Paper	*Envelopes*
Duke (7 in. × 5⅜ in.)	Duke (3¾ in. × 5⅝ in.)
Albert quarto (8 in. × 6 in.)	Albert quarto (4¼ in. × 6¼ in.)
Post quarto (9 in. × 7 in.)	Post quarto long (3½ in. × 7⅜ in.)
Large post quarto (10 in. × 8 in.)	Large post quarto (4 in. × 9 in.)

The Effect of "POP" on Personal Writing Paper Sizes

"POP" is the abbreviation for the Post Office Preferred range of envelopes. This is a range of sizes which has been recommended for use by postal administrations all over the world and qualifies for a lower rate of postage for inland letters. Envelopes outside the preferred range may of course still be used, but they attract a higher rate of postage.

Two envelope sizes which hitherto have enjoyed quite wide popularity—Post octavo (3¾ in. × 4¾ in.) and Large post octavo (4¼ in. × 5¼ in.)—fall outside the POP range and ultimately this must have an effect on the demand for the matching writing paper sizes—Post octavo (7 in. × 4½ in.) and Large post octavo (8 in. × 5 in.).

POP regulations are dealt with in greater detail in the chapter covering envelopes.

British Standard Sizes

The following has been extracted from the appropriate British Standard. The method of expressing the dimensions of notepapers, pads, etc., in Table I follows the traditional British system. Work has been carried out by the International Organisation for Standardisation (ISO) with a view to standardizing a range of sizes in writing paper and envelopes based on the metric system of measurement, on an international basis. Certain A and B series of trimmed sizes are given in Table II for guidance.

NOTE. Where metric equivalents are stated in Table I, the figures in British units are to be regarded as the standard. The metric equivalents are approximate. More accurate conversions should be based upon the tables in British Standard "Conversion factors and tables." In Table II, the metric values are to be regarded as the standard.

Personal Stationery Measurements

(*a*) *Envelopes.* Envelope measurements shall be in the form used in British Standard "Commercial envelopes (terms and sizes)." These are detailed in chapter 7.

(*b*) *Notepaper.* The order of measurement of notepaper shall be as follows:

(1) *Fly.* The first measurement shall be that of the fold line and the second measurement at right angles to the fold line—*i.e.*, the face of the folded sheet and not the sheet opened flat (*e.g.*, 7 in. × 5⅜ in. fly).

(2) *Single.* The vertical measurement shall be given first.

(*c*) *Pads.* The first measurement of a pad shall be that which is at right angles to the binding, followed by the measurement of the bound edge.

Personalized Stationery

This is the generally accepted term for writing paper which has been printed, die-stamped or embossed with the correspondent's address, telephone number and sometimes with the writer's name. In consideration of this type of order, three essentials have to be borne in mind.

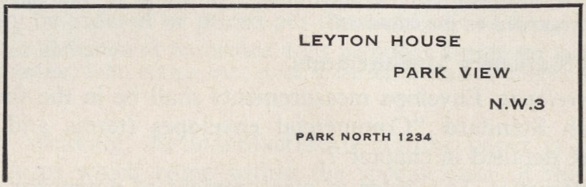
(*a*) Purpose—The type of customer and individual requirement;
(*b*) Layout of address;
(*c*) Method of reproduction;

Purpose: The advantage of headed writing paper is, of course, its clarity, but of equal importance is the individuality and air of personal good taste which it imparts to the letter. The correspondence media which a person uses are his ambassador and very often are the means of conveying a first impression to someone else.

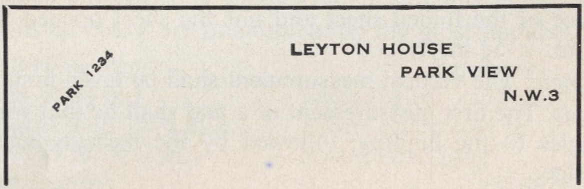
The customer requiring headed writing paper will invariably be more selective in his choice of paper and style of heading, and every attention should be given to his requirements, as, with this type of business particularly, there is always the question of repeat orders. As with all things where individual taste is concerned, the customer's requirements will vary considerably and to some extent will also depend upon whether the paper is required by a man or a woman, for personal or family use, or perhaps for semi-business use. The choice of younger people can also be different from that of older people.

Layout: With few exceptions, headed writing paper conforms to three basic layouts, as shown in the following examples.

(1) Address and telephone number at the top right-hand corner of the sheet (abbreviation: T.R.H.C.).



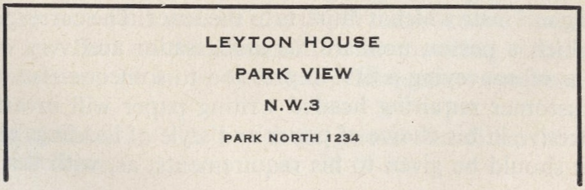
(2) Address at top right-hand corner (T.R.H.C.) and telephone number set obliquely in the top left-hand corner (abbreviation: T.L.H.C.).



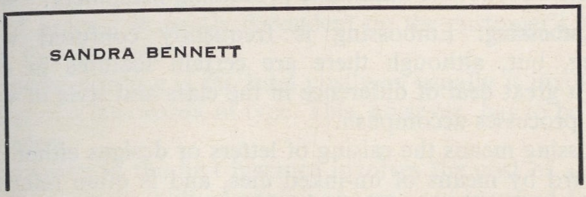
Sometimes a telephone number is preferred in a straight position, and great care should be taken to ascertain which of these two positions is required.

Occasionally the choice may be for the address to be situated in the top left-hand corner (T.L.H.C.). In this case, all lines are then "flush" to the left-hand edge instead of "staggered" as in the illustration. Addresses in the T.R.H.C. may also be flush to the left side, but this is not common.

(3) Address and telephone number centred at the head of the sheet. This position is known as top centre (abbreviation: (T.C.).



(4) When a name is required, this is usually set in the top left-hand corner straight position, with or without the address appearing opposite.



Initials, monograms or crests may also be required. According to the process, blocks or dies will be required to be made specially. The customer must supply a drawing or have one made, and in either case the drawing should be larger than the eventual impression to facilitate accurate reproduction.

Method: There are four main reproduction processes for personalized stationery. The first three are dealt with fully in the chapter on Printing Processes, but it will assist the student to describe them *briefly* at this point.

(1) Letterpress Printing: In this process, headings are printed direct from type which has been assembled letter by letter by a compositor. The type is then placed in a steel frame and held in position with expanding wedges so that the whole "forme" can be lifted and placed into the printing machine. An alternative method is to set the type, not letter by letter, but by machine on "slugs"—*i.e.*, lines of type—in a linotype machine.

The printing machines used for small headings are generally those known as plattens, with the sheets fed singly by hand. Often, however, automatic machines such as the Heidelberg are used and the paper is fed in automatically.

(2) Die-Stamping: Steel dies of the address are made by various methods, which include hand engraving, photo-engraving and mechanical routing. A force or counterpart of the die is made with thick card by bringing the die and the card together under heavy pressure.

The die is inked, and the surplus ink on the surface is removed by wiping with paper, leaving the engraving filled with ink. The paper to be stamped is inserted between the die and the force and when pressure is exerted the force drives the paper into the engraving in the die to transfer the ink and produce the raised surface that is the characteristic of this process.

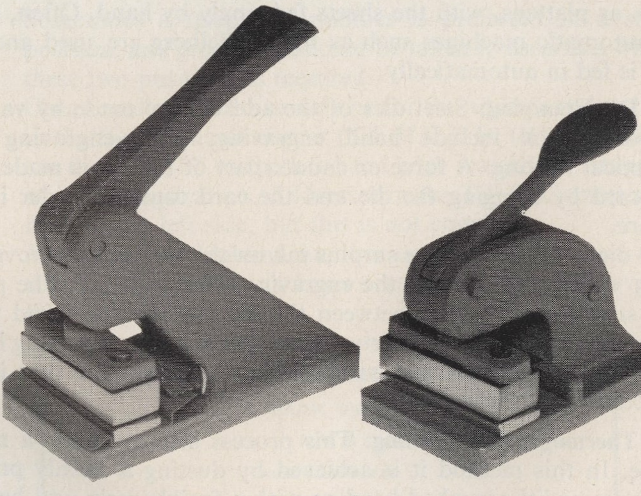
(3) Thermographic Printing: This process also produces a raised surface. In this method it is achieved by dusting a freshly printed letterpress or lithographed heading with a fusible resin and heating so that the resin fuses and amalgamates with the ink. The finished effect provides a comparable alternative to die-stamping without the necessity for steel dies. Competitive costs have now become possible by the introduction of automatic processing machinery.

(4) Embossing: Embossing is frequently confused with die-stamping, but, although there are certain features in common, there is a great deal of difference in the class and style of work that the two processes accomplish.

Embossing means the raising of letters or designs either on paper or on card by means of un-inked dies, and is often referred to as "blind stamping." Two dies are necessary: the first, known as the "female" die, has engraved into it designs which are to be produced, so that the inscription is below the surface level; the second, or "male" die, counterpart, or force, is made from the female die, and here the letters or designs are in relief, and of such a size that they fit exactly into the sunken portions of the female die. The method of making this force is quite different from that used in die-stamping.

The paper or card to be embossed is then laid between the two dies, pressure is exerted, so that the dies are brought together, and the paper or card is depressed into the recesses of the female die. When the dies are opened the lettering or design will have been produced in relief on the surface of the paper or card.

Various materials may be used for the female embossing die, such as steel or brass, while the male counterpart or force may be made from a soft metal such as aluminium, copper or lead. In the case of hand embossing presses for addresses on private notepaper, or of



Embossing Presses.

company presses used for sealing documents, the female die is generally made of steel and the counterpart of copper or aluminium.

Ordering Considerations

Choice of process is mainly dependent on the customer's taste and the cost. For example—

Letterpress printing is the least costly as usually it involves only the setting of a few words of type. This, however, has to be reset for repeat orders.

Die-stamping in the first instance involves the cost of a die, but, once a die is made, only stamping charges are incurred for repeat orders. On the other hand, two dies are necessary if the telephone number position is different from that of the address. Minor alterations are usually possible on dies. It must also be borne in mind that, where more than one colour is required in the stamping, the paper will have to be stamped twice, for only one colour can be applied at a time. Only one die is necessary, however, as the colour change is taken care of in the manufacture of the force.

Thermographic printing provides an alternative to die-stamping without the cost of the dies.

With these three processes quantity is important, as price depends on the number of sheets printed or die-stamped. The larger the quantity, the less expensive the overall cost of each item.

Hand embossing presses are available in considerable variety, and this method can be described as comparatively inexpensive. New dies and counterparts can be fitted to existing presses.

It is advisable to point out to the customer that the embossing press is *not* suitable for stamping post-cards or correspondence cards, unless the manufacturer indicates that it will do so.

Sometimes the embossing is intended to be at the foot of the sheet, or on envelope flaps, and in these cases it must be clearly stated on the order, as the dies will have to be specially fitted in the press for this purpose.

It is also well to remember that the sizes of the dies that can be used in hand-embossing presses are limited, and when an order is being taken it is advisable to compare the amount of wording required with the amount in that particular type style shown in the manufacturer's illustrated list. The addresses shown on these sample sheets are in most cases examples of the longest line of lettering that can be accommodated in the various styles, so that the stationer should encounter no difficulty in this direction.

Most manufacturers supply sample books of papers, styles and colours, and some supply order forms preprinted, so that relevant information may be inserted easily. Irrespective of whether these or the stationer's own order forms are used, every care should be taken with spelling, punctuation, style, position, colour, etc., and orders should be carefully checked before they are sent to the supplier.

A useful routine in the taking of such orders is as follows:—

Quantity
Type, size and colour of paper, fly or single sheets
Method of reproduction and colour
Details of copy, style and position
Quantity of plain continuation sheets
Quantity of envelopes
Proofs, price and delivery.

Finally, it is desirable that a record is kept of such orders, together with specimen sheets. Often customers will repeat their orders "as before"; consequently it will save endless time and trouble if the previous order can be located quickly and efficiently. In the case of die-stamping the customer may require the stationer to retain his die, and this will entail a system of careful storage with easy reference.

2. Visiting and Business Cards

As with personalized stationery there are three essentials to be borne in mind:

(*a*) The purpose for which the card is to be used, and the person by whom it is to be used.

(*b*) The layout to be employed.

(*c*) The method of reproduction.

Purpose: Although the original reasons for which calling or visiting cards were introduced have long since ceased to exist, cards are still widely used for exchanging addresses and for business purposes. It is important that they are prepared in accordance with recognized conventions.

There are several formalities to be observed in the use of different sizes of cards, the correct designation of titles, and the method of layout. Cards are made in a number of sizes, and the trade name of each, together with its size, is listed below:

Smalls	$2\frac{3}{8} \times 3\frac{5}{8}$ in.
Reduced Smalls	$2\frac{1}{8} \times 3\frac{1}{2}$ in.
Towns	2×3 in.
Extra Thirds..	$1\frac{3}{4} \times 3$ in.
Thirds	$1\frac{1}{2} \times 3$ in.

The accepted conventions that decide the appropriate size of card for a particular purpose are as follows:

(1) Private visiting cards:

Men	Thirds or Extra Thirds
Ladies	Smalls, Reduced Smalls, or Towns

(2) For business cards used by representatives of commercial firms the size will be dependent on the amount of "copy" required. Extra Thirds is a popular size, although sometimes a Smalls can be recommended if there is a great deal of detail to be shown on the card.

(3) For a business card required by a director or an executive of a firm, the size should be Thirds or Extra Thirds, so that it can also be regarded as a personal card.

(4) Thirds or Extra Thirds should be used by professional men, doctors, architects, etc.

(5) Officers in H.M. Forces must use Thirds size cards, with the exception of Officers in the Women's Royal Air Force, where the Air Council Regulations stipulate that the size must be Smalls.

Layout: For private visiting cards name and address only is conventional, but today there is a marked tendency to include telephone number. On a man's card the name of a club may be printed in the bottom right-hand corner.

Private cards

Men	It is customary to use the prefix "Mr." before the name—e.g., Mr. Charles F. Carruthers. Today it is a matter of choice, however, and to some extent dependent on the length of the name line.
Wives	Use husbands' Christian names—e.g., Mrs. Charles Carruthers
Widows	Use their maiden Christian name—e.g., Mrs. Elizabeth Carruthers
Divorcees	Replace the former husband's Christian name or names and revert to their maiden Christian names—e.g., Mrs. Elizabeth Carruthers
Titles	Peerage (e.g., Duke, Marquess, Earl, Viscount or Baron)

Dukes	Duke of Rushworth
Duchesses	Duchess of Rushworth
Marquesses	Marquess of Granby
Marchionesses	Marchioness of Granby
Earls	Earl of Barchester
Countesses	Countess of Barchester

Viscounts	Viscount Hornchurch
Viscountesses ..	Viscountess Hornchurch
Barons	Lord Strand of Essex
Baronesses ..	Lady Strand of Essex
Baronets and Knights	Sir Dennis Lowe
Wives of Baronets and Knights ..	Lady Lowe (not Lady Dennis Lowe)
Dowagers	This is a title given to a widow to distinguish her from the wife of her late husband's heir—Dowager Lady Bradleigh; or, in the case of the widow of a Baronet or Knight—Mary, Lady Bradleigh

Where the children of Dukes or Marquesses have the courtesy title of Lord or Lady, this is shown before their Christian names—*e.g.*,

Lord James Roberts
Lady Cynthia Roberts

Earls usually have lesser titles as well, and the eldest son of an Earl will take one of these as his own—*e.g.*,

Viscount Belpher (eldest son of the Earl of Emsworth)

The younger sons of Earls and all sons of Viscounts and Barons have the prefix "Honourable" (abbreviated to "Hon.") before their Christian name or names—*e.g.*,

Hon. James Dallimond

Qualifications and Decorations

No academic or professional degrees, decorations or honours should be shown on private visiting cards, other than the prefix "Dr." where appropriate. Where the prefix "Dr." is shown, the name is not followed by the initials of the degree confessing the doctorate—*e.g.*, Dr. Charles Skinner (not Dr. Charles Skinner, M.D.).

On visiting cards for members of H.M. Forces, decorations such as D.F.C., M.C., etc. are not shown.

Officers of H.M. Forces

Royal Navy ..	Officers below flag rank (flag rank means above the rank of Captain) have "Royal Navy" or the initials "R.N." below their name, slightly to the right of centre. The name of the officer's ship is printed at the foot of the card on the left-hand side.

	Officers holding the rank of Lieutenant and above have the rank indicated; below this rank the prefix "Mr." is used.
Army	The lowest rank designated on visiting cards is that of Captain. Officers of Corps such as the Royal Artillery, Royal Armoured Corps, Royal Engineers, show the name or initials of the Corps. Other units often indicate the regiment below the name, but this is generally governed by the customs of particular regiments.
Royal Air Force	Officers holding the rank of Flight Lieutenant and above have the rank indicated; lower ranks use the prefix "Mr.". The abbreviation of "Royal Air Force" to "R.A.F." is not permissible. The wording "Royal Air Force" is placed immediately under the name, off centre to the right.
Women's Royal Air Force ..	Women officers below the rank of Flight Officer have the prefix "Miss" or "Mrs." as applicable; otherwise the same pattern is followed as for male officers in the Royal Air Force.

Professional Cards

Degrees or specific qualifications may be included, plus any other distinctive title to which the user may be entitled—*e.g.*, "Doctor" or "Professor." Here again, the prefix "Doctor" etc., and the initials of the degree should not both be printed—*e.g.*, George Wright, M.A., LL.D. (not Dr. George Wright, M.A., LL.D.).

Medical Profession

A surgeon or consultant physician is styled "Mr." and qualifications are shown after the name. A general practitioner is styled "Dr." and no qualifications should be indicated. A dentist is styled "Mr.," with either "Dentist" or "Dental Surgeon" under the name.

Business Cards

There are no special rules appertaining to business cards, which may embody a trade mark or symbol, if required, in addition to any other matter. It is important that the layout is such as to give prominence to any particular details which need emphasizing.

Examples of Visiting Cards

Viscount Dunmow

Dunmow House

Lady Bull

Holme Lodge,
Bracknell.

Mr. JOHN BROWN

19 THE AVENUE,
POTTERS BAR.

William Smith

Brook Street, W.1. Reform.

MRS. JOHN BROWN

19 THE AVENUE,
POTTERS BAR.

Mrs Phyllis Brown

42 The Avenue,
Gerrards Cross

Colonel John Blimp,
R.A.

LIEUTENANT JACK TARR
ROYAL NAVY

H.M.S.

---

580 1212

Dr. Thomas Guy

Harley Street, W.1.

MR. CHARLES GROOME
M.B., B.S.

High View,
Perranporth

Phone
1234

WILLIAM SCRIVENER, F.C.A.
DIRECTOR AND SECRETARY

EXPORT SALES LTD.,
NEW STREET,
BIRMINGHAM.

PHONE
4321

Telephone:
580 0101

SMITH & JONES, LTD.,
Printers and Stationers

Presented by:
MR. R. B. LUCAS.

City Road,
London, E.C.2.

Method: There are five processes which can be used in the production of visiting cards, of which the first three are most often employed. Three of the processes have already been mentioned under Personal Stationery.

(1) Copperplate Printing: The wording required is engraved in reverse on to a copper plate, the size of which is dependent on the size of card required. The plate is then inked all over; the excess ink is wiped away with rags and the plate is polished, leaving the engraving filled with ink.

The card is laid on the plate and very heavy pressure is applied, which forces the card into the engraving, so picking up the ink. The result is that the printing is raised on the surface of the card. Cards printed in this way can always be determined by this characteristic.

(2) Letterpress Printing: See Section 1.

(3) Die-stamping: See Section 1.

(4) Thermographic Printing: See Section 1.

(5) Lithographic Printing: This method is based on the principle that grease and water do not mix. In simple terms, a greasy image is prepared in one way or another on a smooth stone or metal plate.

The surface is damped and then a suitable ink is applied; this adheres to the greasy image, but not to the damp parts. The print is then transferred to the card by applying pressure.

A development of this method is offset lithography, and here the print is first transferred to a rubber blanket or roller and then printed or "off-set" on to the card. There have been considerable developments in this field and further explanations will be given in the chapter covering Printing.

Ordering Considerations

The process will be determined by several factors: whether the card is a private one or for business purposes; whether a large or a small quantity is being ordered; and whether a high-class card or something cheaper is required. Most printers offer a "run-on" price after the first 100, for all processes so that the larger the quantity the less expensive the cards will be. The deciding factors will invariably be the quantity of cards required, the amount of money to be spent, and the class of finish desired. Whatever process is used, however, if the job is well executed and the layout is a good one, some really excellent results may be obtained.

Private Cards

Copper-plate is the best method for private cards, and wherever possible the customer should be so advised, for the method of reproduction is as important in point of etiquette as the use of correct layout.

It is always useful to point out that alterations can easily be made on the plate if a change of address takes place: the old address is erased and the new one is engraved in its place. There is, however, a limit to the number of times a plate can be altered.

It is important to remember that the size of plate will determine the size of the cards which can be printed from it for subsequent orders. For example, it is not possible to print a card that is smaller than the plate. (However, if a name line only is involved and the size of engraving is suitable, it is possible.) Similarly, it is not a practical proposition to print cards that are larger than the plate, because the edges of the plate would leave a mark where the card overlaps the plate.

Printing from a copper plate is mostly in black ink, as this is the most satisfactory colour for the process. If a colour is required, then the cost is increased by at least 50 per cent. It is also necessary to interleave cards printed by this method with tissue, to prevent "off-setting," as the ink used never quite dries completely.

Letterpress printing is an alternative method if price is a consideration. Some excellent results may be achieved, but the quality of work never quite equals copperplate printing and the difference is obvious to the experienced eye. Where, for example, script lettering is used, apart from the fact that no relief effect is obtained, there will be a distinct break between each letter instead of the continuous line produced by the copper-plate method.

Thermographic printing provides an alternative without the cost of a plate, and produces a relief effect. Die-stamping and lithography are not normally used for private cards.

Business Cards

These may be produced from any of the processes already mentioned. Again, the best method is copper-plate printing and the cheapest is letterpress printing. In addition, die-stamping is frequently used where long runs or special effects are required. However, the cost of die or dies must be taken into consideration. Thermographic printing is, once again, an alternative to copper-plate printing or die-stamping without the cost of plate or die.

Lithography is used only where very long runs are involved and is thus very expensive for small orders.

Cards

A final word, but by no means the least important, concerns the card itself, for, however well the printing process may have been carried out, it can be spoilt by an inferior card. Ivory board should be used. This is a high-grade board of two or more laminations of identical quality pasted together. It is free from spots and wire marks, pure in colour and "look-through," and possesses a characteristic rigidity and tin-like rattle, and the edges are clean cut.

For additional effect "panel" cards are sometimes used, though normally only for letterpress and thermographic printing and die-stamping. They may be single or twin panel, and either "plate sunk" or "plate raised"—that is to say, a blind blocked panel is produced on the face of the card to give a raised or sunk appearance to the panel. While cards may be plate marked for each order as a separate operation (essential if for die-stamping), they can be produced and supplied as blanks in bulk.

Sample books and orders

As with the printing of personal stationery, most manufacturers supply sample books of cards showing sizes, styles, etc. Some also supply order forms showing the information required and to be filled in. Care must be taken with spelling, punctuation, qualifications, style, layout, etc. Many people nowadays insist on the omission of punctuation marks, but others require them to be included. Orders should be carefully checked before being sent to the printers.

A routine should be adopted for the taking of such orders, and the following sequence is suggested.

Quantity.
Size and quality of card.
Method of reproduction and colour.
Details of copy, style and position.
Proofs, price and delivery.

It is also useful for a record to be kept of such orders for the convenience of repeat ordering. Where customers require the stationer to retain the copper plate or die, careful storage must be arranged, together with a means of easy and quick reference.

3. Invitations

As in the case of visiting cards, the main considerations are:

(*a*) The purpose—or occasion—of the invitation.
(*b*) The layout.
(*c*) The method of reproduction.

Purpose: Invitations cover a very wide range of occasions—at homes; luncheons and dinners; cocktail parties; bridge parties; twenty-first birthdays; silver and golden weddings.

Some of these occasions are of a formal nature and others quite informal and unofficial. Thus it is that there is no accepted convention as to the type of invitation which should be used for any particular occasion, and this is usually determined by the taste of the person responsible for the arrangements.

In general, smaller cards are used for private invitations, and larger sizes for public and official functions. Often invitations for semi-official or private events are printed on notepaper—usually hand-made—which may be either fly or single sheets, or on deckle-edged cards. Consideration must be given to the size so as to conform with POP regulations from July, 1968.

Layout: The same general rules as to titles etc., apply as with visiting cards. The layout for formal invitations follows certain normal lines, but for informal occasions quite a lot of latitude is permissible.

The invitations illustrated should prove a useful guide.

Method: Invitations may be produced by the same methods as for visiting cards, but the most usual are copper-plate printing and letterpress printing, and similar factors of quality, price and quantity determine which shall be used.

Ordering Considerations

When an oral order for invitations is taken the following points should be noted:

(1) Name of person issuing the invitation, with particular regard to the spelling.

The President & Council of the British
Stationers & Office Equipment Association
request the pleasure of the company of

....

at Dinner
at the Dorchester Hotel, W.1
on Friday, 10th December at 8 o'clock

6 Wimpole Street,
London, W.1

R. S. V. P.

Mrs John Brown
at Home
Friday, May 17th
at The Café Royal

Abbey Lodge,
Hall Road,
N.W.8.

Dancing 9 p.m. to 1 a.m.
R. S. V. P.

Will you come for

Cocktails

at 99 Devonshire Street, W.1

on……………………………………………………………………

R.S.V.P. Mr & Mrs Laurence Priestley.

(2) Type of function—*e.g.*, "Dinner," "At Home," "Bridge Party," etc.
(3) Place, date and time of function.
(4) R.S.V.P. address.
(5) Additional copy—*e.g.*, "Dancing," "Cocktails," etc.
(6) Any special requirements as to style of layout.

Finally, the copy should be verified and signed by the customer as correct.

As with visiting cards, sample books and order forms are usually available. A routine should be adopted for taking such orders, and that detailed above under visiting cards is equally applicable to invitations.

Social Cards

It is convenient to note here that many preprinted cards are available to suit almost every occasion. The wording is either formal or informal style and there is a wide range of design and quality.

Due to printing in quantity they are less costly than specially printed invitations. All the sender has to do, in order to complete, is to fill in the relevant information.

Similar cards are designed for announcements, acceptance or declining of invitation, change of address etc.

....

request the pleasure of

....

Company for ....

on .... *at* .... *o'clock*

.... *R. S. V. P.*

Please come for Coffee

on ....

at ....

....

.... *R. S. V. P.*

....

.... *much pleasure in accepting*

....

kind invitation for ....

....

....

regret .... *inability to accept*

....

kind invitation for ....

....

4. Wedding Stationery

This is an important class of trade, for it covers a number of items, and an order that has been well handled may enable the enterprising stationer to supply the newly-married couple with the stationery they require in setting up house and lead to a continuance of their business in the years that lie ahead.

Wedding stationery is easily dealt with by the retailer, as the publishers who produce it provide books of specimens, from which customers may make their choice, and order form for completion.

The first item in this range is the invitation, and, when the particular style has been decided upon, the following details should be carefully noted:

(1) Name, initials and titles (if any) of the parents or sponsors issuing the invitation (following the same general rules as previously mentioned).
(2) Christian name of the bride; name, initials and title (if any) of the bridegroom, and his rank and service if in the Forces.
(3) Place, date and time of marriage service, and details of any subsequent reception which is to be held.
(4) R.S.V.P. address.

Methods of reproduction are again as those for visiting cards, and the same observations apply, with copper-plate for the best type of invitation, and letterpress for the least expensive.

Then there are wedding hymn sheets, cake boxes, complimentary cards, bride's record book, etc. In the case of complimentary cards, the copy required to execute an order is the bride's maiden name (ascertain if it is to be cancelled with an arrow), the bridegroom's full name, the date of the wedding, and the new address of the bride and groom.

There are also preprinted cards, on which the sender only has to fill in the relevant information. They are less costly and suitable for small quantities.

5. In Memoriam Stationery

This class of stationery has to a very large extent gone out of fashion. Years ago it was the custom for a family in mourning to use black-bordered note-paper; it is still used to-day, but to a far less extent.

The width of the border was denoted by the terms Italian, narrow, middle, broad, etc. Nowadays mourning stationery almost invariably has the Italian border, which is the narrowest of all. In passing, it is of interest to note that black bordering is, and always has been, a hand process.

Return thanks letters and cards, which are usually required at short notice, are generally letterpress printed or lithographed from

Dr. & Mrs. Thomas Sawyer

request the pleasure of the company of

……………………………………………………………………………

at the marriage of their daughter

Mary

to

Mr. David Trevor

at the Parish Church, Cumnor, Berkshire

on Tuesday, 12th May

at 2.30 o'clock,

and afterwards at

The Royal Hotel, Cumnor

Marlow House,
Cumnor, Berkshire

R. S. V. P.

a writing, and in memoriam cards are produced by specialist publishers who issue books of specimens to facilitate ordering. In addition, some printers undertake such work and often carry a stock of memoriam card blanks which can be completed with any desired wording. Alternatively preprinted cards are available.

6. Printers' Card Blanks

In addition to specially printed and preprinted cards already mentioned, there is a considerable demand for blank cards which can be printed locally to requirement.

To produce the card blanks to meet the need of each order as it arises would be much too costly. There are available, however, ranges of printers' blanks from which printers can invite their customers to make their choice. Some stationers stock a selected range of blanks and sell them as such, for the customer to use as he requires.

In addition to visiting and business cards, some of which have one or two embossed panels, the cards offered are suitable for the local printer to complete by overprinting for:—

Commercial use:	Postcards, payment cards, change of address cards, appointment cards, advice and advertising cards.
Functions:	Announcements, invitations, admission tickets, dance tickets, programmes, menu cards, place cards.
Personal occasions:	Wedding cards, Christmas cards, memorial cards.

According to the purpose for which they are to be used, cards vary in size, colour and style: the more elaborate ones can incorporate embossed or die-stamped designs and have coloured, deckled or gilded edges. For cards which are likely to be sent through the post, suitable envelopes are normally available.

It is emphasized that the cards are "blanks"—available as a service to the local printer. For instance, Christmas blanks consist of single or folding cards which carry appropriate designs or motifs. The local printer adds the verse matter and address required by his customer.

British Standards

To meet the requirements of the customer, which are often dictated by fashion demand, there is a wide variety of sizes and qualities. The appropriate British Standards are listed below and are generally recognized throughout the trade.

(1) Definitions

(*a*) *Cloth lined*	A layer of cloth so pasted to paper or board as to provide one surface of cloth and the other of paper or board.
(*b*) *Cloth centred*	Layers of paper or board so pasted to cloth as to provide a cloth centre with paper or board surfaces.
(*c*) *Deckle edged*	A rough natural edge, originally the characteristic of hand-made paper. The term is now also recognized for a similar effect produced artificially.
(*d*) *Duplex board*	A board so manufactured, by coating, pasting or felting two or more webs, as to provide different colours on each side.
(*e*) *Ivory board*	A high-grade board of two or more laminations of identical quality pasted together possessing a characteristic transparency and rigidity.
(*f*) *Pulp board*	Board manufactured in one thickness or by bringing two or more thicknesses of board or paper into a single structure on a multiple-wire machine—thus distinct from boards prepared by laminations of paper pasted together.
(*g*) *Paste board*	Two or more laminations of paper pasted together, usually provided with a middle of lower quality and facings of better quality.
(*h*) *Surface board*	White or tinted coated board.
(*j*) *Panel cards*	Cards providing one or more blind blocked panels.
(*k*) *Plate sunk cards*	Cards providing one or more blind blocked sunk panels.
(*l*) *Plate raised cards*	Cards providing one or more blind blocked raised panels.
(*m*) *Fly cards*	Double or folded cards—*i.e.*, folded in half to produce two leaves (or four pages).
(*n*) *Single cards*	Unfolded cards providing one leaf (or two pages).

(2) Units for Ordering

The units for packaging, ordering and pricing printers' cards and blanks shall be as follows:

1000s. 100s. 50s.

NOTE. It is usual trade practice to supply 4 per cent. "extras" to provide necessary spoilage for proofing and printing—*i.e.*, 1040, 104, 52.

(3) Measurement of Printers' Cards and Blanks

(*a*) *Fly.* The first measurement shall be that of the folded line and the second measurement at right angles to the fold line—*i.e.*, the face of the folded card and not the card opened flat (*e.g.*, 7 × 4½ in. fly).

(*b*) *Single.* When processed (*e.g.*, printed, die-stamped or ruled) the vertical measurement shall be given first, but when unprocessed the smaller dimension shall be given first.

(4) Abbreviations

The following abbreviations are recognized as standard for use in association with printers' cards and blanks:

B.B.	Black bordered.
C.B.	Colour bordered.
S.C. or R.C.P.E.	Square corners or round corners plain edges.
S.C. or R.C.Gilt E.	Square corners or round corners gilt edges.
S.C. or R.C.Gilt B.E.	Square corners or round corners gilt bevelled edges.
S.C. or R.C.Gilt B.D.E.	Square corners or round corners gilt bevelled deckle edges.
S.C. or R.C.Gold E.	Square corners or round corners gold edges.
S.C. or R.C.Gold B.E.	Square corners or round corners gold bevelled edges.
S.C. or R.C.Gold B.D.E.	Square corners or round corners gold bevelled deckle edges.
S.C. or R.C.S.E.	Square corners or round corners silver edges.
S.C. or R.C.S.B.E.	Square corners or round corners silver bevelled edges.
S.C. or R.C.S.B.D.E.	Square corners or round corners silver bevelled deckle edges.
P.D.E.	Plain deckle edges.
I.H.M.D.E.	Imitation hand-made deckle edges.
P.S.	Plate sunk.
P.R.	Plate raised.
R.S.	Relief stamped.
P.P.R.	Printed paper rate.

(5) Bordering Widths

The following nomenclature and measurements shall apply to widths for bordering:

Italian	1 mm. wide	Broad	6 mm. wide
Narrow	2 mm. wide	Extra broad	8 mm. wide
Middle	4 mm. wide	Double broad	12 mm. wide

(6) Sizes

The British Standard sizes of printers' cards and blanks are as follows:

	in.		in.
Thirds	$1\frac{1}{2} \times 3$	Large court	4×5
Extra thirds	$1\frac{3}{4} \times 3$	*Duke	$3\frac{1}{2} \times 5\frac{1}{2}$
Town	2×3	Extra large	$4\frac{1}{8} \times 5\frac{7}{8}$
Duchess	$3 \times 5\frac{7}{8}$	Double large	$4\frac{1}{2} \times 6$
Rex	$3\frac{1}{4} \times 5$	Cabinet	$4\frac{1}{4} \times 6\frac{1}{2}$
Reduced small	$2\frac{1}{8} \times 3\frac{1}{2}$	Post 8vo	$4\frac{1}{2} \times 7$
Diamond	$3\frac{1}{2} \times 5\frac{1}{4}$	†Double official	$5\frac{1}{2} \times 7$
Small	$2\frac{3}{8} \times 3\frac{5}{8}$	Quad small	$4\frac{3}{4} \times 7\frac{1}{4}$
Imperial card	$3\frac{3}{4} \times 5\frac{3}{4}$	Large post 8vo	5×8
Extra small	$2\frac{1}{2} \times 4\frac{1}{8}$	Quad large	6×9
Large	$3 \times 4\frac{1}{2}$	Royal 8vo	$6\frac{1}{8} \times 9\frac{7}{8}$
Court	$3\frac{1}{2} \times 4\frac{1}{2}$	Royal 4to	$9\frac{7}{8} \times 12\frac{3}{8}$
Double small	$3\frac{5}{8} \times 4\frac{3}{4}$		

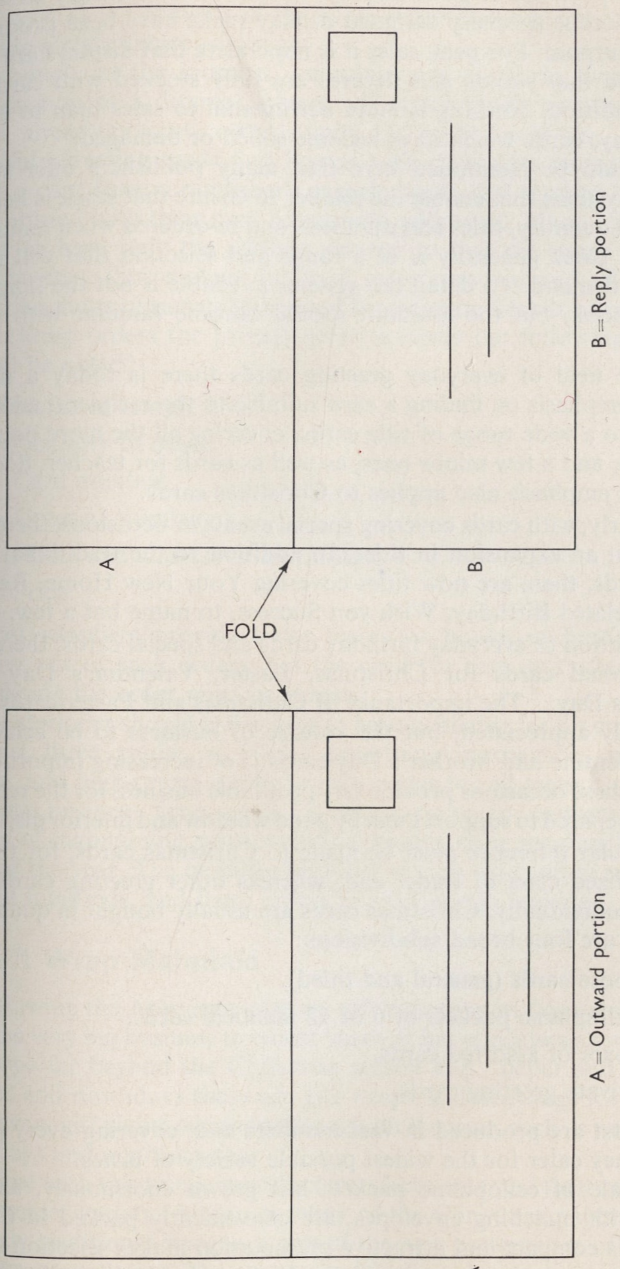
* This size is also known as "Official" when used for postcards.

† The Post Office has directed attention to the frequent inconvenience and rejection of reply cards arising from the fact that cards are so printed that, when folded, both addresses appear on the outside. Reply cards should be made up on the same lines as the official reply cards issued for sale at Post Offices, that is, with one of the addresses inside whichever way the card is folded and with the postage stamp positions adjacent to the fold (see illustration).

7. Greeting Cards

Greeting Cards is the generic term covering a most popular and important section of the stationery trade. The sales of birthday cards and special occasion cards (available for almost every conceivable event) have grown to such proportions during the past few years that card shops, dealing exclusively in greeting cards, have been opened in numerous towns throughout the country.

The vast range of designs offered by the publishers meets the requirements of the taste, personality and purse of everyone. Singly-boxed birthday cards costing up to twenty or thirty shillings each are now freely sold in all localities, and the volume of sales of birthday cards throughout the year is greatly in excess of the ever-growing total of Christmas card sales.


A
B
FOLD
B
A
A = Outward portion
B = Reply portion

Reply card

The importance of good displays cannot be too strongly stressed, and numerous specially designed display racks have been produced for the purpose. For peak sales it is imperative that displays are well sited, and that stands and fixtures are fully stocked with cards in mint condition. Nothing is more detrimental to sales than to have, on display, cards which have become soiled or damaged.

It should be mentioned here that many publishers offer stock control systems that enable the retailer to ensure that stock is kept in sufficient quantity, titles and numbers, and re-ordered when required, and that stock generally is of a range and selection that will meet popular demand. To detail the systems available is not the function of this book, but the assistant should become familiar with such systems.

In the field of everyday greeting cards there is today a much greater emphasis on finding a card suitable to the recipient, and this has led to a wide range of title cards, covering all the more popular relations, and a few minor ones, as well as cards for teacher, doctor, etc. This emphasis also applies to Christmas cards.

Similarly, with cards covering special events or occasions, there has also been an expansion in titles. In addition to the traditional Get Well cards, there are now titles covering Your New Home, Retirement, Belated Birthday, Wish you Success, to name but a few.

In addition to everyday birthday cards and special cards, there are the seasonal cards for Christmas, Easter, Valentine's Day and Mother's Day. The importance of Christmas and Easter cards will be readily appreciated, but the volume of business to be achieved with Valentine and Mother's Day cards is of increasing importance. Both of these occasions provide very profitable business for the retailer who is prepared to support them by good window and interior displays.

Particular reference must be made to Christmas cards, for this is a specialized class of trade, and, whereas other greeting cards are bought individually, Christmas cards are usually bought in quantity.

There are four broad subdivisions:

(1) Loose cards (general and titled).

(2) Cellophane packets of 6 or 12 identical cards.

(3) Boxes of assorted cards.

(4) Private greeting cards.

The first are produced in vast numbers and, covering every price range, they cater for the widest possible variety of tastes.

The sale of cellophane packets has grown enormously, as the cards, with matching envelopes, are conveniently packed in 6's or 12's. This compact and attractive presentation makes selection easy, and at the same time prevents the cards from becoming soiled while on display.

Big value boxes containing an assortment of 12, 18, 24 or 36 cards sell freely, as the contents of the boxes represent excellent value and provide a wide choice of design.

Although, at the moment, quantities are based on dozens, the introduction of a decimal system will undoubtedly accentuate the move, already present, towards units and multiples of ten.

Private greeting cards find favour with customers who prefer to select a card from a publisher's sample book, and then to have the card printed with their own names and addresses. Many customers prefer to have only the address printed so that the name may be hand-written, thus making the card more personal and allowing a Christian name or names to be used for intimate friends or relations.

In taking orders for private greeting cards the following details should be noted:

(1) Name of sample book.
(2) Quantity of cards.
(3) Card number.
(4) Greeting number.
(5) Name and address to be printed.
(6) Price.

Most suppliers provide order forms or books to facilitate the making out of such orders, but the need for care and attention in completing the order must be stressed.

The stationer should endeavour to have available for his customers at least three grades of books containing inexpensive, medium-priced, and high-priced cards, so as to cater for all tastes.

Many business firms send Christmas cards to customers as a means of maintaining contact and expressing their good will at that time of the year. The quantity required in such cases often runs into several hundreds, and these orders are well worth seeking.

8. Gift Wrap Materials

Following the American pattern, gift wrapping in this country has become very big business in recent years. It has considerably widened its scope far beyond the Christmas season and "paper and string" image, and nowadays there are gift wraps and dressings for practically every gift giving occasion throughout the year, such as weddings, birthdays and anniversaries.

In line with this trend, manufacturers have enlarged their ranges to give greater variety. Although many of the Christmas papers retain strongly traditional designs, many of the new patterns are of a more contemporary design. The popularity of colour stripe, plain and polka dot design is also increasing, while many everyday wraps incorporate motifs appropriate to a recipient's sporting interests or hobbies. Some of the papers have matching tags and ribbons to provide continuity in colour and design.

The principal items comprising this range are:—

(1) Wrapping Paper (the usual size is 20 in. × 30 in.).

(2) Tags and Gift Cards.

(3) Ribbons and Bows. (These are made from rayon—plain, striped and embossed, and sold in hanks, on drums and spools.)

(4) Seals and Labels (mainly at Christmas).

(5) Gift Boxes. (These are of board or acetate).

At Christmas many of the above are made up into packs of assorted materials.

Now that people of all age groups are showing greater interest in the presentation of gifts, stationers are giving greater thought and devoting more space to the display and selling of this merchandise throughout the year. In this, they are fully supported by leading manufacturers who supply a variety of free standing and counter sales display units.

The gift wrap service, whereby for a few shillings, the customer can have gifts professionally wrapped while they wait, has now become an integral part of the modern shopping scene. Apart from service to the customer, it can also prove profitable, particularly in helping to increase sales of gift wrap lines generally.

9. Calendars

The range of calendars is almost without limit. Consequently there is considerable choice in design, size, type and price. Whilst it is impossible to detail this wide variety, calendars can nevertheless be classified into various groups.

Firstly they may be divided into two classes:

(1) Commerical.

(2) Fancy.

Secondly, each of these classes is catered for in the following types:—

(1) Daily, weekly or monthly tear-offs on plain or pictorial mounts.

(2) Pictorial spiral-bound turnovers.

(3) Desk, pocket and purse.

(4) Perpetual or mechanical.

Some types, particularly those used on the desk, are made so that the calendar itself is refillable each year, while the perpetual or mechanical type lasts indefinitely and often incorporates pen stands or trays, ash trays and the like.

The sale of pictorial monthly turnover calendars has increased greatly in recent years and very many beautiful productions are available, covering a large variety of special subjects. Many of these are published by national newspapers and periodicals, and the publicity given to them in these publications greatly stimulates the sales. These are very popular for sending overseas and are normally supplied with postal cartons.

When used commercially, many of these types can be made to special order incorporating advertising matter. For the smaller user, stock mounts are available for overprinting as required, thus obviating the high cost of an original production.

10. Diaries

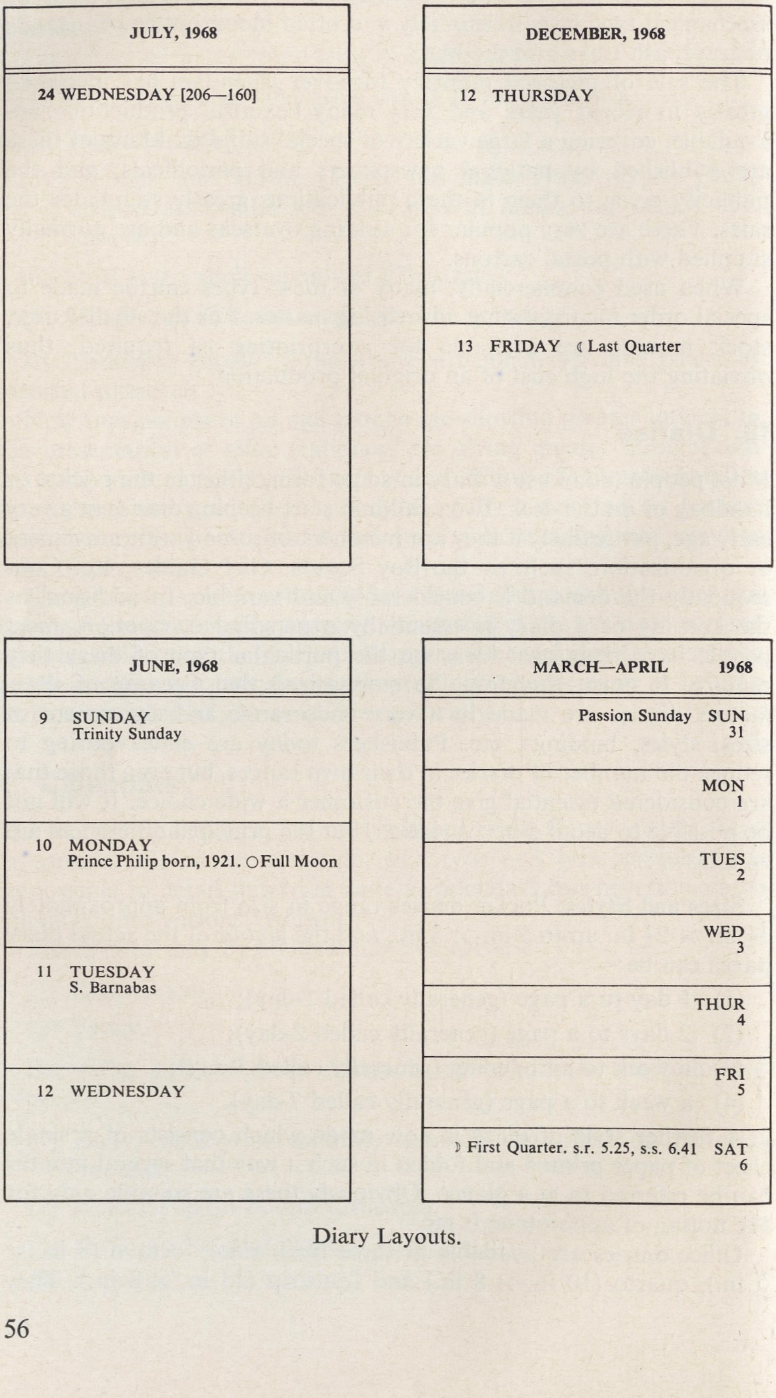
Most people today use a diary in some form, either in the pocket or handbag or on the desk. Even children start keeping diaries at a very early age, particularly if they are members of some youth movement or organization, such as the Boy Scouts, Girl Guides, etc. Consequently the demand is considerable and variable. In addition, as the keeping of a diary is essentially a personal occupation, most people have their own ideas on the particular type of diary they require. It must, therefore, be emphasized that because of these factors diaries are made in a very wide range and assortment of sizes, styles, bindings, etc. Publishers today are endeavouring to reduce the number of diaries in their own ranges, but even those that are considered essential give the customer a wide choice. It will not be possible to detail every variation, but the principal differences are as follows:—

Sizes and Styles: Pocket diaries range in size from approximately 3½ in. × 2½ in. up to 5 in. × 3 in., and the layout of the actual diary pages can be:—

(1) 1 day to a page (generally called 1-day);
(2) 2 days to a page (generally called 2-day);
(3) a week to an opening (generally called 3-day);
(4) a week to a page (generally called 7-day).

A further style of diary is now made which consists of a single sheet of paper printed and folded in such a way that several months can be referred to at a glance. Obviously these are suitable only for the noting of appointments etc.

Office diaries are available in three main sizes—octavo (8 in. × 5 in.), quarto (10 in. × 8 in.) and foolscap (13 in. × 8 in.). They



JULY, 1968

24 WEDNESDAY [206—160]

DECEMBER, 1968

12 THURSDAY

13 FRIDAY ☾ Last Quarter

JUNE, 1968

9 SUNDAY
Trinity Sunday

10 MONDAY
Prince Philip born, 1921. ○Full Moon

11 TUESDAY
S. Barnabas

12 WEDNESDAY

MARCH—APRIL 1968

Passion Sunday SUN 31

MON 1

TUES 2

WED 3

THUR 4

FRI 5

☽ First Quarter. s.r. 5.25, s.s. 6.41 SAT 6

Diary Layouts.

follow the same page layout as the pocket editions. The most popular is probably the octavo 3-day style, followed by octavo 1-day, but all other sizes and styles are important within the range.

Paper and Binding: The paper used for pocket diaries also varies, both in quality and colour. The cheaper qualities tend to bulk more whilst in better qualities it is thin yet opaque. Choice of paper and binding must be considered together. The materials used for binding, commencing with the least expensive, are:—

(1) Laminated print;
(2) Book cloth;
(3) Imitation leather or plastic;
(4) Skiver leather;
(5) Full leather—*i.e.*, morocco, calf, pigskin, etc.

The same comments apply to office diaries, although the papers generally are of necessity more substantial and the bindings normally limited to (2), (3) and (5) mentioned above. There are many refinements that can be incorporated according to price and demand—for instance, pencils, ribbon place markers, perforated corners, button fastening, etc. Some diaries are made with a season ticket pocket; others have an indexed address book section included.

Pocket Diaries: These can be divided into two classes—*i.e.*, ordinary open pocket diary, which has a few pages of general information at the front, and the specialist diary, which has many pages of detailed information relevant to its particular title. Open pockets generally have a much larger range of colours and bindings to appeal to the person who does not require a diary for any specific trade or hobby. Specialist diaries are published for practically all hobbies or sports, such as fishing, gardening, motoring, etc., and can also cover the more universal field, such as schoolboys, schoolgirls, and trades such as engineering, woodworking, building and so on.

Five-year diaries are also made, usually in a larger size than the pocket edition. These are needed to allow five-year comparisons for each day and some of these diaries are fitted with a lock and key.

Office Diaries: In addition to the sizes and styles mentioned above, there are many variations that can be included in this section of office diaries. Appointment diaries are similar to the ordinary type, but are also printed with time intervals and sometimes divided into morning, afternoon and evening.

Tablet diaries are either weekly or monthly, usually spiral-bound at the head with a paper or board cover. Another type (often referred to as a desk calendar) is a block of loose sheets, punched to fit a stand for desk use. With this type notes can be written on the blank backing page which can be referred to at a later date. They are also refillable.

Although not so popular as the pocket specialist diary, some desk size specialists are also published. These can fill a dual purpose in that specialist information is conveniently at hand.

As with pocket diaries, the office diary range is wide and varied, but all are designed to fulfill some particular need of the user.

Advertising Diaries: The diary is exceptionally suitable for advertising purposes. An advertising diary can be a stock diary, specially blocked with name, crest, etc., or made to order with a number of specially printed pages and other features. Whether they are for association, club, business, or any other purpose, the field is a large one and should not be overlooked by the stationer.

11. Playing Cards

Playing cards, and the accessories for playing many card games, represent an important item of the social stationery stock.

The usual conventional patterns in red and blue designs are favoured by card clubs, and for whist and bridge drives. Then there are more elegant designs beautifully printed in gold and colours, with gold or sprinkled edges, tastefully boxed, sometimes in pairs, which are particularly suitable for bridge, where it is usual to employ two packs of cards.

The number of card players, all of whom are potential customers, should not be under-estimated; and the fact that the leading national newspapers regularly feature bridge columns must be a stimulant to the sales of packs of cards.

Washable plastic cards are available, and with normal use these are practically indestructible. Although the initial price is often high, because of their long-lasting qualities these cards are frequently used by bridge teachers and in bridge clubs. For those who are blind or who have poor eyesight, special packs are produced either in Braille or printed with large characters.

The accessories for card games, such as bridge score cards, whist score cards, bezique markers, patience cards and cribbage boards, are all part of a comprehensive stationer's stock and should be given prominent displays, particularly at Christmas time and during the winter months.

From 1615 until quite recently, playing cards in Great Britain were subject to Revenue duty, every pack having to bear a special Revenue wrapper, which had to be carefully preserved intact until the time of sale. This duty was abolished in 1960.

12. Household Paperware

Hitherto this category of merchandise has been described as "Table Stationery," but in recent years its scope has widened both in range and importance, so that a more appropriate description should now be introduced.

The range contains many items which in the broadest sense enhance and facilitate the service of food.

The wider use of disposable paper is playing a progressively important role in the modern way of life. Time-saving and labour-saving, economic and hygienic, with attractive designs over a wide range of items, household paperware makes a major contribution to gracious living. It can be readily classified under the following headings.

Paper Napkins and Squares

Whereas at one time the use of a paper napkin was for a special occasion, nowadays a napkin for every meal is essential for civilized living.

The multi-ply napkin, which is soft and absorbent, compares favourably in use in every respect with the linen napkin, and possesses also the important advantage that the initial cost is less than the laundry charge for a linen napkin. Multi-ply napkins are available as white squares in sizes 17 in., 14 in. or 10 in. in beautiful plain deep tone colours or printed in many attractive designs.

At a lower price is the single tissue of semi-crepe quality which serves a more utilitarian function, and is available as squares or printed.

All napkins are available either in attractive packets or in larger quantities for catering establishments, boarding houses, etc.

Lace Papers

These consist of doyleys, tray papers and dish papers.

Doyleys, either fully laced or with solid centres, are marketed in a variety of attractive designs reminiscent of the traditional embroidered linen work of the Swiss, French and Irish and may be in white or colours, silver or gold. They are available in sizes from 4½ in. to 10½ in. in diameter and even larger if required for special purposes. They are marketed in attractive packs with counter display units, and are also available in bulk packs for more economical buying.

Tray papers are also laced and embossed in a wide variety of designs suitable for trays or trolleys in a range of sizes from 10 in. × 7 in. to 20 in. × 14 in. They are available either in packets or by the gross.

Dish papers are oval lace-edged patterns with an embossed border and are mostly used in the service of fish, grills and entrées. They are available either packeted or in bulk, in a range of sizes from 7½ in. × 5½ in. to 18 in. × 14 in., suitable for all dimensions of oval serving dishes.

Paper Plates and Drinking Cups

It is in these items that there have been the greatest recent advances, primarily because plates are now available with a coated surface which is resistant to water and grease and facilitates the serving of a hot meal. They are not only suitable for picnics and parties, but can provide economic and useful service in normal daily use by saving washing up. They range in size from 6 in. to 9 in. from a side plate to a main meal plate, and are available either in hygienic packs for counter display or in bulk for catering establishments.

Drinking cups, with capacities from six to ten ounces, have also widened in their scope, being now capable of serving very hot drinks and having a taste-free surface. They are invaluable for picnics, parties, dances, etc.

Trifle Cases

This category covers a range of sizes and shapes in different forms of decoration to provide disposable containers for the accommodation of jellies, trifles and ice creams and the display of chocolates, nuts, etc.—generally on party occasions. Jelly cases have a capacity of from 4 to 8 oz., and soufflé cases are normally of 2-oz. capacity. They are available packeted or can be bought singly from a display carton or in bulk for larger occasions.

Household Paperware.

Party and Wedding Specials

There are many items under this general heading whose names are self-explanatory, including cake frills, cake decorations, place markers, sandwich markers, confetti, wedding cake boxes, cake boards, table covers, drinking straws, place mats, cocktail mats, etc. For weddings specially printed silver serviettes and silver doyleys and appropriate place markers are available supplied in packeted form, together with such items as confetti, horseshoe mascots and orange blossom sprays.

Christmas Items

Most of the items described above are available for Christmas with appropriate motifs of Father Christmas, candles, holly, etc. These are available in napkins, doyleys, place mats, and all the different sizes of trifle cases. There are cake frills appropriately decorated or bearing the words Merry Christmas.

Kitchen Paperware

Baking Cases and Baking Tin Cases: For home-made cakes, baking cases and baking tin cases save the greasing of tins and are made to resist oven heat and to keep the flavour in the cake mixture. Coloured and floral printed cases are popular for fancy cakes and *petits fours.*

Shelf Paper: Shelf paper is now available in many delightful designs, and is usually supplied in rolls 20 in. wide, the price being dependent on the length. In most cases the surface is waxed or plasticized to facilitate the easy removal of stains.

Kitchen Rolls: Rolls of absorbent kitchen paper, for which holders can be purchased separately, are becoming more and more popular. They have a variety of uses, such as in substitution for hand towels, cleaning grease from cooking utensils, etc.

Aluminium Foil: This product is used extensively in cooking and for wrapping food which is to be kept in the larder or refrigerator. It is also most useful and practical as a covering for sandwiches, keeping them moist and fresh for a considerable time. It is marketed in two widths, the attractive cartons being made complete with a cutting edge. The larger-sized rolls sell particularly well at Christmas time for roasting turkeys and other poultry.

Greaseproof Paper: Greaseproof paper is presented for resale in many handy forms—packets of flat sheets, hanging packets for kitchen use and in continuous rolls.

Polythene Bags: These are available in many sizes for the storage and wrapping of food, particularly when kept in refrigerators.

CHAPTER 3

Writing Instruments

The title of this chapter can of course cover anything that enables one to write with. However for purposes of classification it will cover Fountain pens, Stylographic pens, Ball point pens, Felt and Fibre tipped markers and Propelling pencils.

The choice and use of these articles is essentially a matter of personal taste and consequently time and very often patience is needed when selling them. Not the least important is a thorough knowledge of the instruments generally.

Other writing media, such as steel pens, ordinary pencils, and typewriters, are dealt with elsewhere.

1. Fountain Pens

Brief History and Origin

The origin of the fountain pen goes back about 250 years, and as long ago as 1663 Samuel Pepys mentioned in his *Diary* that a friend had promised to send him "a silver pen which would hold ink."

One of the earliest patents was obtained in 1809 by a man named Frederick Bartholomew Fölsch, for "several improvements calculated to promote facility in writing." In the same year Joseph Bramah filed a patent for "a new method of making pens, pen-making machines, penholders, and fountain pens." This specification described a hollow tube, tapering at one end, with a perforation near the point and a cork or cap at the other end to make it air-tight. The tube was thinly made so that pressure between the thumb and fingers holding the pen produced the flow of ink.

The first really practicable portable pen containing its own ink supply was not, however, patented and made until 1886, and self-filling pens did not follow until the early 1900's.

Many patents have been filed since those days, new improvements are constantly being made, and the early pioneers would be astounded at the modern streamlined, precision-made fountain pens, so different from the crude instruments of their time.

Principle

Basically a fountain pen comprises a barrel, section (or nib-carrier), feed, nib, and a cap (excepting in desk pens which are not carried in the pocket). The principle is that the barrel contains a reservoir of ink which is allowed to flow to the nib through the feed. When the pen is held nib downwards the ink in it is affected by a variety of forces, such as gravity, capillary attraction, air pressure, etc., but in a reliably made, properly adjusted fountain pen, these forces will remain in a state of equilibrium and the ink will not run out. However, immediately the nib is brought into contact with a writing surface, that state will alter and the ink will commence to flow.

Manufacture

Early models of fountain pens were made from vulcanized rubber (vulcanite), which was an excellent material for the purpose, as it was light, true when worked, and did not present many manufacturing problems.

In later years the vogue for colour entered the fountain pen world and manufacturers were faced with the problem of making vulcanized rubber into coloured holders, but, although mottled colours (mainly "red mottled," a combination of streaky black and tan) and plain tan brown, were produced, these colours tended to be drab, and it was not found possible to produce bright shades in vulcanite.

As a result firstly casein was used to obtain bright colours, but this was found unsatisfactory as it was hygroscopic and thus not entirely static. Subsequently celluloid was used, which required a long period of maturing under heat to avoid shrinkage or warping, and had the disadvantage of being inflammable.

Pens made from vulcanite, casein and celluloid were produced from rods and tubes, cut to lengths, bored, and machined to the sizes and shapes required for the barrels, caps, sections and feeds, and then assembled with the addition of bands, clips and other necessary metal parts, and finally the nib.

Nowadays the holders of fountain pens are made from modern plastic materials by injection moulding, and in most cases parts are produced from the moulds with such a high degree of surface finish that they can be used without further operations. Both internal and external threads can be moulded in, and frequently decorative metal inserts are also moulded into the plastic components.

The manufacture of gold and stainless steel nibs is explained later, and it cannot be too strongly emphasized that a pen is no better than the nib with which it is fitted: the better the nib, the higher the standard of efficiency of the pen.

Filling Systems—Non Self-filling Pens

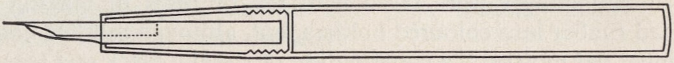
The first fountain pens were, of course, non "self-filling" and, although these are now obsolete, it is as well for the retailer and his assistant to know something about these pens as a few are still in use.

There were two main types: the "regular" and, slightly later, the "safety propelling" pen, which was a development of the "regular" in an attempt to produce a pen which would not leak in any position provided that the cap was properly screwed on.

The "regular" type fountain pen consisted of five component parts:—the barrel, nib-section, feed, nib, and cap.

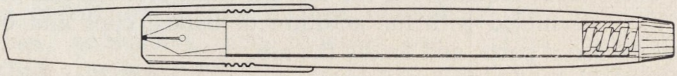
The barrel is the ink reservoir, and its size determines the ink capacity. To fill the pen, the barrel should be held at an angle and the ink put in, by means of a glass drop-filler, so that it runs down the inside of the barrel drop by drop, thereby enabling the air to escape and preventing any air bubbles.

The nib-section carries the feed and the nib. It screws into the barrel, and the most satisfactory method of filling is to fill the barrel to capacity and then to screw in the nib-section, displacing the surplus ink and creating an air-tight, ink-tight joint.



Regular Type Fountain Pen.

The "safety propelling" pen was of a propel-repel design (see sketch); when the pen was not in use, a twist at the back-end of the barrel caused the nib-section to be withdrawn inside the barrel, and a plug in the screw-on cap produced an effective seal. In this way the ink supply was completely cut off and leakage was prevented.



Safety Type Fountain Pen.

Filling Systems—Self-filling Fountain Pens

These are pens which contain their own mechanism for filling and do not have to rely upon any such thing as a drop-filler. By reason of their simplicity and their filling facility they have superseded the "regular" and "safety" patterns.

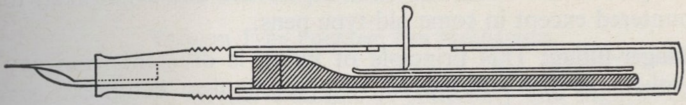
Since the introduction of self-filling pens, the earliest of which was operated by inserting a coin into a slot in the barrel to compress the sac, many different methods of operation have been introduced, some of which have now become obsolete. However, since some of the earlier systems are still in use, the principle of the main self-filling systems in use since the days of non self-filling pens will be outlined.

Broadly speaking, there are five systems which are virtually obsolete today and six which are in current use to a greater or lesser degree. It is interesting to note that the lever-filling principle, first invented in the U.S.A. in 1908, is still in current use.

The former comprise:—	The latter comprise:—
Stud	Lever
Leverless	Press-sac
Pump	Piston
Plunger	Pneumatic
Vacuum.	Capillary
	Cartridge.

The following descriptions are more or less in order of their historical introduction; *hence they are not in the same order as listed above.*

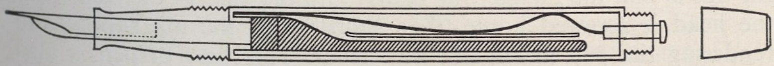
Lever-filling: In this type of pen the barrel contains a full-length rubber sac which is the reservoir for the ink. Also inside the barrel is a strip of metal known as the presser bar, which operates in conjunction with a lever positioned on the outside of the barrel. When the lever is raised at right angles to the barrel, the bar is depressed, thus deflating the rubber sac, and expelling the air.



Lever-filling Type Fountain Pen Mechanism.

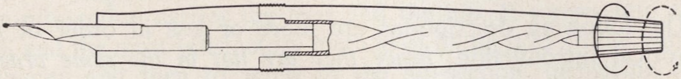
The nib section is then placed in the ink and the lever lowered to its original position. This causes ink to rush into the sac to occupy the space formerly filled by air. After the lever has been lowered, the nib-section should remain in the ink for a few seconds to allow the sac to fill to capacity. On being withdrawn from the ink, the nib and the nib-section should be wiped clean, and the pen is then ready for use.

Stud-filling: This is similar to the lever-filling. The barrel contains a rubber sac and a presser bar, but the presser bar is operated not by a lever, but by means of a stud housed in the end of the pen. A cap is screwed off to expose the stud, which when depressed actuates the presser bar in the same way as already described in the lever-filling method.



Stud-filling Type Fountain Pen Mechanism.

Leverless-filling: This is similar in principle to the lever and stud-filling methods, in that there is a rubber sac as the ink reservoir, and a metal presser bar. Inside the barrel is a metal bar which has a twist in it. The bar is attached to a knurled knob at the head of the pen. A half-turn of the knob causes the bar to roll concentrically across the sac, completely compressing it and expelling the air. A half-turn back, restoring the knob to its original position, releases the sac, and, with the nib-section immersed, causes ink to rush in to replace the air. Thus, with two half-turns the ink reservoir is filled to capacity.

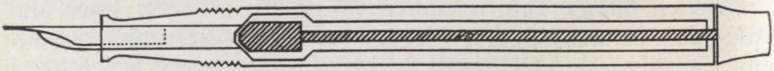


Leverless Type Fountain Pen Mechanism.

Pump-filling: Here the barrel is itself the ink reservoir and it contains no separate rubber sac. The method of filling is by pump action on the suction principle, rather like a bicycle pump. The disadvantage is that a considerable portion of the barrel is occupied by the handle of the pump, so reducing the ink capacity. This type of filling mechanism has now been superseded and is not likely to be encountered except in some old-type pens.

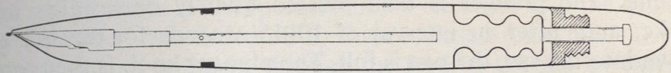
Plunger-filling: This principle of filling is different from any of the others so far referred to. The mechanism comprises a rod, running the whole length of the barrel, with a plunger fitted to it which just fits the barrel's diameter. Here again there is no rubber sac, the barrel itself being the ink reservoir. To fill the pen, the end of the barrel is unscrewed to release the plunger rod, which is withdrawn to its fullest extent. The nib-section is then inserted in the ink and the plunger rod is pressed home, care being taken to ensure that the nib-section remains immersed until the completion of the downward stroke. The act of depressing the plunger causes the air to be expelled from the barrel, thus creating a vacuum behind the plunger head. At the completion of the stroke, however, the plunger enters a chamber of a slightly greater dimension than the barrel; this immediately breaks the vacuum, with the result that ink flows in and fills the reservoir. The head of the pen is then screwed up as it was prior to the filling operation.

When the pen is required for use, the head should be unscrewed half a turn in order that the ink may flow through the feed. The reason for this is that the plunger fits tightly into the base of the feed when the head is screwed home, thus shutting off the ink supply and rendering the pen absolutely leak-proof. This type of pen is also manufactured with visible ink supply.



Plunger Type Fountain Pen Mechanism.

Vacuum-filling: This method embodies a breather tube extending along the interior of the barrel, from the feed to the opposite end, where the filling mechanism is situated. The filling operation is performed by depressing and releasing the lever or stud until the pump action is hard. The depression of the lever or stud causes a diaphragm or rubber sac in the mechanism to be deflated, thus forcing air out of the breather tube. On the release of the pressure, the diaphragm or sac returns to normal and ink flows into the pen to replace the expelled air. Repetitive depression and release of the stud or lever for a few strokes enables the pen to be filled to capacity. Many pens of this type had barrels of a transparent material which permittted the ink content to be seen at a glance. Some were made in which the sac was deflated by the fingers instead of mechanically.

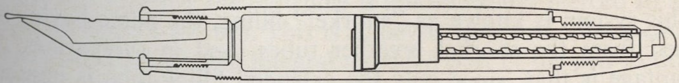


Vacuum Type Fountain Pen Mechanism.

Piston-filling: A further example of simplicity and high efficiency is the popular "piston" type. In this system the front portion of a two-part barrel and section of the pen are inseparably joined together, the front portion of the barrel being usually made from transparent material so that the quantity of ink in the pen is visible. Inside the barrel is a piston operated by a spiral rod, the rear part of which is housed into the rear portion of the barrel.

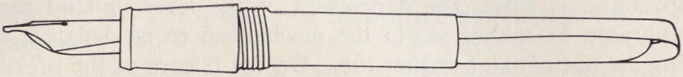
While the pen contains a charge of ink, the piston remains at the rearmost position in the barrel, the spiral actuating rod and piston being accommodated in the rear portion of the barrel.

To fill the pen, the knob at the rear end of the barrel is turned anti-clockwise until resistance is felt, which advances the piston to its most forward position, thus expelling air from the ink reservoir. The nib is then immersed in a supply of ink and the knob turned clockwise until it is screwed tight again, thus fully withdrawing the piston and drawing ink into the barrel by the vacuum created.



Piston Type Fountain Pen Mechanism.

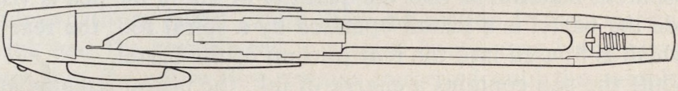
Press Sac-filling: This type of filling is self-descriptive in that the sac is compressed by a presser bar, operated directly by the fingers, the presser-bar being revealed by unscrewing the barrel of the pen. The sac is usually partially or completely protected by a metal guard. Where the guard is complete (like an inner barrel), access to the presser-bar is given by a window in the guard.



Press Sac-filling Fountain Pen Mechanism.

Pneumatic-filling: The modern pneumatic-filling pen was first introduced in the U.S.A. in 1949. In this pen the sac is enclosed in a metal sheath open at the rear end, which in turn is covered by a metal plunger tube attached to a plunger knob screwed into the back end of the barrel. To fill, the plunger knob is unscrewed (anti-clockwise), the plunger withdrawn, and the nib then immersed in the ink. The plunger is then pressed quickly downwards in one stroke, and, after an interval of 10–15 seconds for the ink to be drawn into the sac, the pen is full. The plunger knob is then screwed back (clockwise) into position.

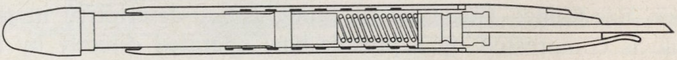
This system is known as "touchdown" filling, the sac being deflated by air-pressure, and it should be emphasized that these pens fill in one *single* downstroke of the plunger: the plunger should not be withdrawn again after the filling operation as this will only force ink out of the sac again.



Pneumatic (Touchdown) Fountain Pen Mechanism.

A further development of the pneumatic "touchdown" system was the introduction in 1952 of a filling tube inside the feed reaching into the sac, which is extended when the plunger-knob at the back end of the barrel is unscrewed. The tube then protrudes beyond the pen-point and is inserted into the ink; this pen also is then filled with one single down-stroke of the plunger, after which the plunger knob is screwed back into position (clockwise), thus retracting the filling tube.

This system is known as "snorkel" filling, the name having been coined from the snorkel breather tubes used in submarines. The advantage is that, since only the extended filling-tube is immersed into the ink, the nib of the pen does not need wiping after filling.



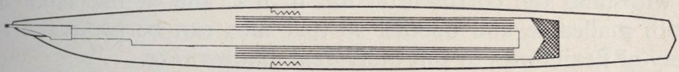
Pneumatic (Snorkel) Fountain Pen Mechanism.

Naturally, by reason of the space taken up by the internal mechanism of these pneumatic-filling pens, ink capacity is reduced, but it is claimed that the advantages of quick filling, and (in the case of the "snorkel" type) cleanliness, outweigh this.

Capillary-filling: In these pens, where self-filling is achieved without moving parts, the principle of filling can be likened to that of a lamp-wick absorbing oil. The reservoir consists of a nest of capillary cells formed by a pre-determined three-dimensional arrangement of foils or fibres.

In some cases the ink is conducted back through the feed so that filling is simply achieved by immersing the point end of the pen into the ink and waiting (usually about 30 seconds) for the ink to be absorbed. In other cases the reservoir is exposed by removing the barrel and immersing the reservoir itself into the ink. In the latter case a sealing valve is incorporated in the barrel so that the capillary cells, once filled, are sealed off to form a closed reservoir.

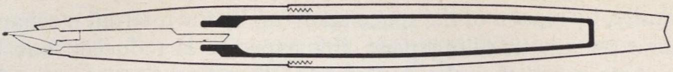
In writing, ink is drawn through the feed to the nib by capillary attraction. Capillary-filling system pens are unaffected by atmospheric pressure or varying temperatures, but, owing to the fine network of capillary cells built into the reservoir, only high-grade sediment-free inks should be used, otherwise the system can become clogged. To clean out and flush these pens a special pump is used, and this operation is advisable if it is required to change to ink of a different colour or type.



Capillary-filling Fountain Pen.

Cartridge-filling: Modern trends towards cleanliness and ease of use have been responsible for the development of these pens, which eliminate mechanical filling and the use of an ink bottle, since the ink is contained in a separate sealed cartridge, which is inserted into the barrel of the pen so that when the barrel and section are screwed together the cartridge is automatically pierced to allow the ink to flow to the nib. This is achieved by a component called a piercer, which may be an integral moulded part of the pen section or a metal component incorporated in the section.

Cartridges are normally made from plastic, usually polyethylene, and are sealed by the provision of a plastic diaphragm or a metal ball lodged in the neck, either of which is displaced when the cartridge is pierced to allow ink to flow through the feed to the nib in the normal manner.



Cartridge-filling Fountain Pen.

Some cartridge pens are fitted with two cartridges so that, when one is used up, the reserve refill, normally housed in the back end of the barrel, can be substituted, but naturally in these cases the individual cartridges are smaller in size.

Certain cartridge pens are also made as "convertible" models, which means that they can be converted by the insertion of a separate filler unit which uses a conventional sac and presser-bar. This is a useful feature if the user of the pen cannot obtain ink cartridges locally or while travelling, since the conversion, of course, enables the pen to be filled from an ink bottle.

Fountain Pen Nibs

Nibs used in fountain pens are normally made from gold, palladium silver or stainless steel. It is no exaggeration to say that the quality of the nib is the principal guide to the quality of the pen, and, while the construction of the nib is deceptively simple, in fact it is both difficult and exacting to make.

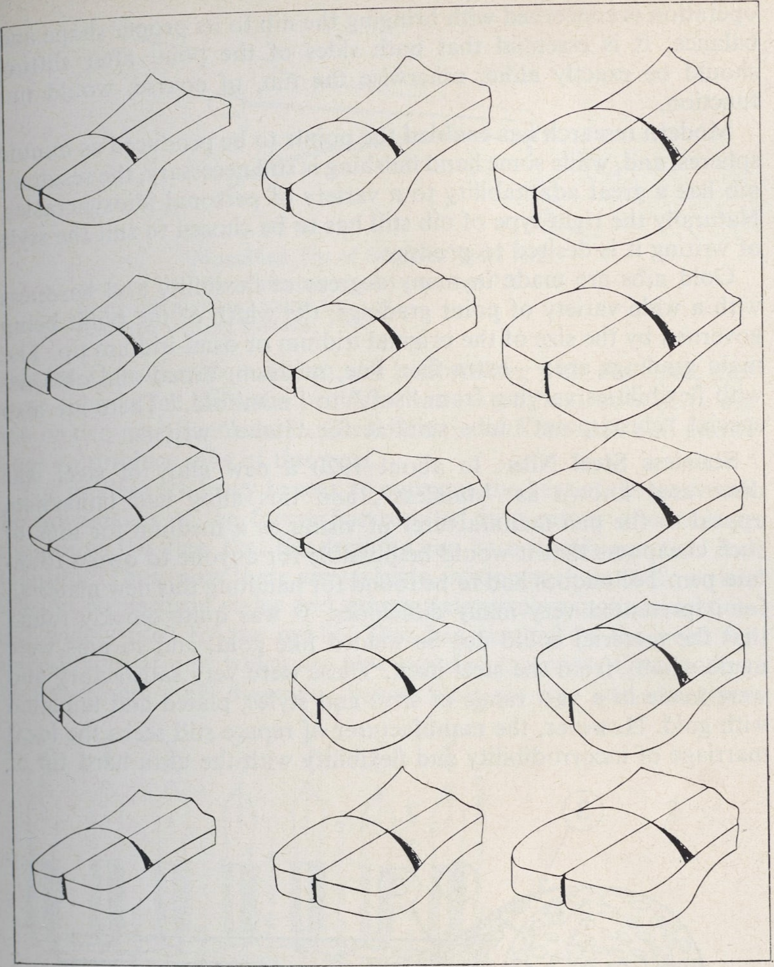
A nib has not only to suit the user as to the style of writing which it will produce, but also to meet the requirements which individual idiosyncrasy demands.

Gold Nibs: Gold is used for the nibs because it is a metal which will withstand the corrosive action of ink, and at the same time is both malleable and ductile, so that nibs can be produced in a variety of flexibilities to suit individual handwriting.

Normally, 14 carat gold, an alloy containing 14/24ths fine gold alloyed with silver and copper, is used for fountain pen nibs as this carat has been found the most suitable. Lower carats, such as 9 ct. or 12 ct., tend to be brittle and to discolour, whereas 18 ct. gold tends to be rather soft, though it is used in France because 18 ct. is the legal minimum requirement in that country. Fine gold—*i.e.*, 24 ct.—is, of course, much too soft for use in nibs.

The 14 carat alloy is in the form of ingots which are rolled into ribbons of the required thickness and width, and from these ribbons flat "blanks" are stamped out. Three sides of the blanks are straight, and the head is shaped to a point to which tiny particles of iridium or osmi-iridium are fused to form the writing surface. This is because it would not be possible to write on gold, which is too soft, so that osmi-iridium, which is one of the hardest known metals, is used to give long life to the writing point.

The blanks next go through a rolling process which at the same time increases the length and tempers the metal, and during this



Magnified Gold Nib Points in Fine, Medium and Broad, Showing in Order
Standard
Stub
Italic
Reverse oblique
Oblique.

process the iridium point has to be protected by means of a groove in the roll.

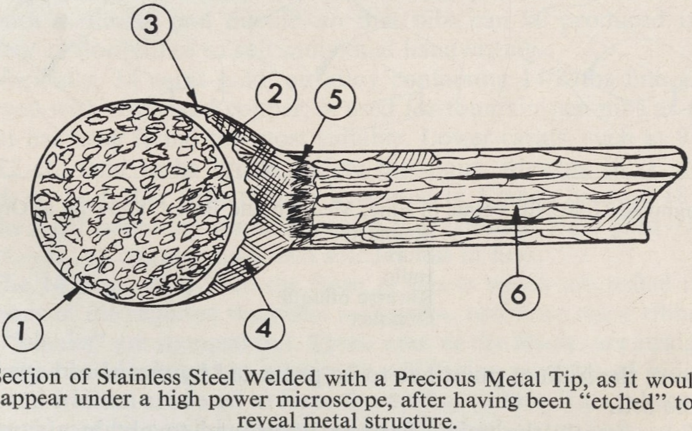
Subsequently the points have to be ground to obtain a smooth finish, and the blanks, still in their flat form, are now placed in dies and raised or curved to the necessary shape.

Slitting is next performed, and this operation leaves the pen with the two halves of the point "spread-eagled," and the subsequent operation is concerned with bringing the nib to its proper shape and balance. It is essential that both sides of the point after slitting should be exactly alike, otherwise the nib, of course, would not function.

Modern research has enabled the points to be produced as minute spheres, and, while some hand finishing is still necessary, the resultant nib has a great adaptability to a variety of personal idiosyncrasies. Naturally the right type of nib still has to be chosen to suit the style of writing it is desired to produce.

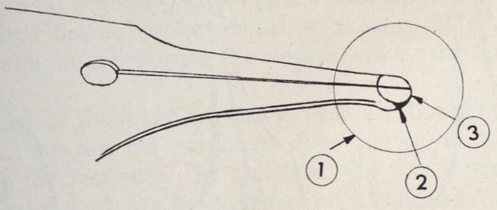
Gold nibs are made in many degrees of flexibility and hardness with a wide variety of point gradings, the width of the point being governed by the size of the original iridium or osmi-iridium tip. The main gradings are:— extra fine, fine, medium, broad and oblique, with flexibilities varying from "soft" to "manifold." There are also special "chisel-point" nibs suitable for "italic" writers.

Stainless Steel Nibs: In about 1920 a new alloy of steel was discovered known as "stainless", and this alloy had immediate appeal to the pen manufacturer of vision as a medium for nibs of such cheapness that it would be possible for anyone to own a fountain pen. Techniques had to be found for handling this new material, for it presented very many difficulties. It was quite quickly found that the material could not be welded like gold, and so nibs were made wholly from the steel itself. These were very satisfactory and were made in a vast range of sizes and styles, plated and unplated with gold. However, the manufacturer of repute still seeks the ideal marriage of incorrodibility and flexibility with the ultra hard tip of



Section of Stainless Steel Welded with a Precious Metal Tip, as it would appear under a high power microscope, after having been "etched" to reveal metal structure.

1. Complex alloy of the tip comprising several metal phases.
2. Region of Inter Alloying with the steel.
3. Metal has flowed round the Tip.
4. Long Needle like form of stainless steel due to melting of the metal.
5. Heated but not melted form of the steel.
6. Cold rolled structure of the steel.

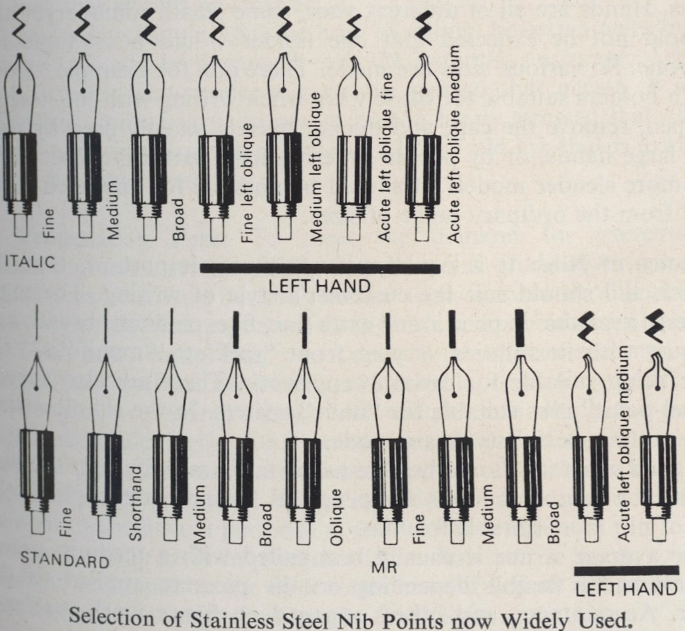


Magnified Tip of Stainless Steel Nib.

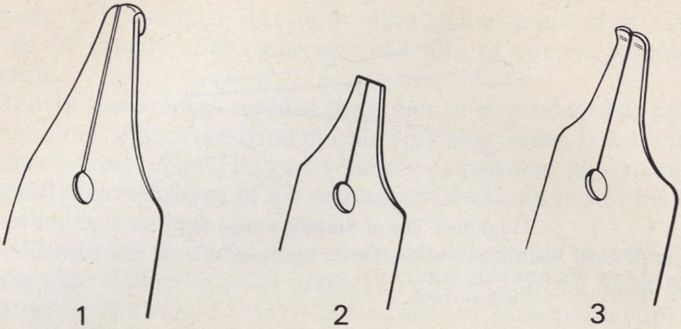
1. Area of the micro section shown on page 72.
2. Long life precious metal tip.
3. Polished writing surface.

iridium. Considerable research was undertaken, with the result that some time in the '50's the problem was solved, and now there are one or two manufacturers in Great Britain with the skill and knowledge to produce nibs of this type.

The modern tendency to seek to continue the best of the past with the advantages of the future has resulted in a return after a long absence to the view that handwriting can be not only practical but beautiful. Thus, now there are styles in writing such as Italic styles, Marion Richardson styles and others, extensively taught in schools and widely used by the public. This has resulted in the need for special types of nibs which are now supplied by most of the leading manufacturers (the diagrams below illustrate the various types


Fine
Medium
Broad
Fine left oblique
Medium left oblique
Acute left oblique fine
Acute left oblique medium
ITALIC
LEFT HAND
Fine
Shorthand
Medium
Broad
Oblique
STANDARD
Fine
Medium
Broad
MR
Acute left oblique medium
Acute left oblique broad
LEFT HAND

Selection of Stainless Steel Nib Points now Widely Used.



Magnified Tips of Three Basic Styles of Nib as Illustrated on page 73
1. Standard.
2. Italic.
3. Marion Richardson.

available) and it is good advice to the retailer that he should be familiar both with the various nibs and with the type of writing that they will produce.

Special Selling Points

Pen Sizes: It is of the utmost importance that a pen should be comfortable to use, and that it should exactly fill the writer's requirements. Hands are all of different sizes, some small, some large, and it could not be expected that one holder would be suitable for everyone. So various sizes are made. There are, for example, short-length holders suitable for those who, when writing with the normal size pen, remove the cap; and thicker barrels, mostly used by men with large hands, or by people suffering from arthritis who cannot grip more slender models. It should be possible for any need to be filled from the ordinary range of sizes.

Choice of Nibs: It is equally, if not more, important, that the nib selected should suit the customer's style of writing. The main gradings available in pens are:—extra fine, fine, medium, broad, and oblique, with flexibilities varying from "soft" to "manifold," the latter being suitable for carbon copy work. There are also special "chisel-point" nibs suitable for "italic" writers. In the stainless steel range, other special styles are made.

A good assistant should be able to tell fairly rapidly from the way in which a customer holds the pen, and the pressure applied, the type of nib most suitable for him.

The average writer is usually best suited with a medium point, either firm or flexible depending on the pressure applied to the paper. Accountants, and others engaged on figure work, prefer a fine, hard nib, as it gives greater clarity; women, and many men too, use an oblique nib, where the pen is held at an angle. For left-handed writers an oblique nib sloping the reverse way to the normal oblique is available.

Since many of the more expensive pens are bought for gifts, and more often than not the purchaser does not know the type of nib required by the recipient, the assistant will find it worth while to point out that the nib can be exchanged if it is unsuitable—provided, of course, that it is undamaged and in new condition.

Where a new nib is supplied, a point to remember is that it can never be quite the same as the old one, even if it is the same size, the same quality and the same shape. The old one, through constant use, will have had its writing point conformed exactly to suit the user's hand, and only use will produce the same effect in a new nib. It is just like a new pair of shoes which, though made of similar material and on the same last, are never as comfortable at first as an old pair.

Filling: The operation of the filling device should always be explained to a customer, as ignorance of it is one of the most common causes of trouble. The customer should be shown the instruction leaflet and guarantee form so that he is fully conversant with the special points applicable to that particular pen. The correct method of carrying the pen and the manner in which to fit the cap are other things that should be stressed.

Not only should the method of filling be explained, but the subject should be discussed with the potential customer. A person who travels may prefer a cartridge pen so that access to an ink bottle is unnecessary. It cannot be too firmly stressed that all pens need good ink, and the casual use of "any old ink that is available" is to be deprecated.

Presentation Pens: To meet the demand for presentations, manufacturers produce fully-covered solid gold, silver, or rolled gold pens which are basically similar to their more humble brethren, but with rich ornamentation their finish is much more elaborate.

Desk sets, comprising one or more pens (or sometimes a pen, pencil and ball-pen to match) with marble, onyx (or plastic, in the lower-price category) bases, with sockets into which the pens fit, also make ideal gifts for presentations. Many of these also incorporate the addition of an ornament such as a clock or calendar, or a special motif such as a horse, hound, veteran car, or other items which might have a personal appeal to the recipient.

Incidentally it is important that a desk pen is made to fit the socket or funnel on the desk stand base; if it does not fit correctly, leakage can occur or flow can be dried up.

2. Pen Repairs

Repairs and Correction of Faults

Accidents will happen to the best of pens, and unexpected situations will sometimes confront the stationer. For example, there is the vouched-for story of a man who bought a fountain pen and then returned to the shop for another one a month or two later, saying that the first one was no more use as it had exhausted its ink supply!

The need for a pen to receive attention may arise from a variety of reasons. Parts may need to be changed because of ageing or wear. Accidental damage may have occurred or, more simply, a pen may need a nib change because the owner received the instrument as a present from someone who chose the wrong grade of nib.

The variety of types of pen is now so great that any attempt to give here a comprehensive guide to servicing would be futile. It is, however, worth pointing out that in many cases the customer may be complaining simply because he does not understand how to use the pen. For example, attempts are sometimes made to fill a rear end capillary-filling pen from the front end, with the result that the owner finds very poor ink capacity!

Many pens still have rubber or plastic sacs, and perishing due to ageing will often lead to poor capacity or leakage. In many cases flow or capacity will become impaired as a result of dried ink, and the fault can be corrected simply by flushing out with water.

To replace broken caps is an easy matter, but to adjust a crossed or bent nib is a delicate operation requiring the skill of an expert, for, unless the points are in perfect alignment, and the nib is correctly fitted to the feed, erratic flow and scratching will result.

Unless the stationer or his assistant has had special training, he should therefore *on no account* try to do his own fountain pen repairs. He will do more harm than good: and the truth of the old adage that a little learning is dangerous is most apt here. Some of the leading fountain pen manufacturers offer free training in pen repairing to suitable staff nominated by stationers. Manufacturers have service and repair departments, and pens should be returned to them for adjustment or for defects to be remedied.

Nevertheless, the stationer should know the cause of common faults and understand how they may be rectified.

Nibs should not be removed: Most manufacturers, in the instructions which they supply with each pen, request that the nib shall not be removed from its section. But people *do* remove nibs—sometimes from curiosity, and sometimes because they think they can correct a fault. And they do not get them back properly. Then the only thing to do is to return the pen to have the nib reset.

Nowadays some pens are specially designed to allow changing of a complete nib unit. This is particularly useful when the pen is intended for specialized work such as lettering and designs. The idea, however, can be very useful as a general rule in case of nib damage, etc.

In pens of this type the unit comprising the nib, feed and a retaining sleeve carries a thread which meets with a corresponding thread in the section of the pen. Changing of the nib unit can, therefore, be carried out by unskilled persons without difficulty. It is, however, very important to ensure that the unit is screwed fully home, as an improperly fitted nib unit can cause leaking of ink from the pen.

Perished Sac: A simple cause of trouble is the perishing of the rubber sac. The symptoms are that the pen will hold less and less ink, the reason being that the rubber has lost its resiliency, for the best rubber in the world will not keep the same elasticity for ever. The remedy is to have a new sac fitted.

It should also be noted that a twisted, kinked or improperly fitted sac can cause poor filling, flooding and erratic flow of ink. It is not always easy to fit a sac correctly, and it is very easy to twist or kink a sac in refitting the barrel.

Inquisitive customers may well fall foul of this danger, and, as it is impossible to tell whether the sac is twisted or not because of the impossibility of seeing through the barrel, such an error can easily go undetected; for this reason it is advisable to let the manufacturer do any refitting of this kind unless the pen mechanic has had special training in this work.

Leaking Pen: A frequent complaint is of a leaking pen. All too often, however, there is no leakage at all and the trouble is caused simply by a *dirty* pen. Once ink gets inside the cap it will spread on to the nib-section and the barrel, so that when the cap is removed the fingers are dirtied and the user imagines there is a leak. The following points should be stressed to obviate this trouble:

(i) The pen should be filled correctly.

(ii) All surplus ink should be wiped from the cap and nib-section.

(iii) In replacing the cap, the pen should be held upright and the cap placed on the pen, *not* the pen into the cap.

(iv) Where there are airholes in the cap, these should be open and free from dirt to allow the pen to breathe and to disperse any moisture which may have collected round the section.

(v) The pen should always be carried upright, for, when it is nearly empty, air pressure may cause the last drop of ink to be forced from the pen, and, if the cap is not firmly in position, this will find its way inside the cap, thus causing the trouble already mentioned.

(vi) The cap should be clean. Once ink has got inside it, the cap should be thoroughly washed in tepid water and dried with tissue paper.

Ink will not flow: In this case the pen should first be checked to see that it has been properly filled. Only clean ink from a bottle should be used, not ink from an open well, which can so easily collect dust and cigarette ash. It should be noted carefully that inks should not be mixed; if a different ink is being used for re-filling, the pen should be first washed out with cold water.

If a pen is left lying on a desk with the nib exposed, the latter will become clogged with dried colouring material and gums from the ink due to the evaporation of water from the ink. Normally this phenomenon is known as corroding, but this is a misnomer, because, in the main, nibs are made from materials which will not corrode, and all that is normally necessary when this "drying out" of ink substances occurs is for the nib and feed to be washed very carefully with warm water, thus removing the sediment caused by the "drying out" of the water in the ink.

An unsuitable nib will cause a pen to flow badly. If the nib is too soft for the writer, the points will open too far when pressure is applied and the ink will not reach the tip. Another point to check is that the nib and feed are in correct alignment; bad adjustment will always interfere with the flow.

A twisted or kinked sac can cause a "hold up" of ink and so be responsible for a stoppage.

Ink flowing too freely: Here again the fault is probably in the position of the nib and feed. This should be checked to see whether adjustment is necessary, for it is by the pressure of the feed against the nib that the flow is controlled.

A pen may sometimes flood when almost empty of ink owing to the expansion of air in the sac caused by warmth from the hand.

Scratchy nib: The points should be carefully checked for damage. With a very fine nib it is often difficult to tell whether the iridium tip is still there. The nib may be crossed, or it may be unsuitable to the user's hand, for, if he is writing on one side with a medium nib, he will be causing the points to turn.

Pen will not fill: Checks should be made to see that the sac has not perished; that the ink has not "clogged" as the result of sedimentation or drying of the ink in the feed, thus blocking the passage; that the filling device is functioning properly. Any of these may be giving rise to the fault.

3. Stylographic Pens

The idea of stylographic pens originated from the stylus already described, the idea being in its basic form to produce a glass tube of small diameter for the purpose of holding ink, with a tapered point, which would be supplied with ink by means of capillary attraction, so that, on application to paper, lines, letters, or words could be recorded.

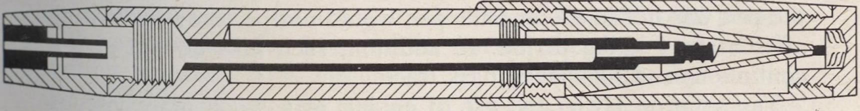
One of the earliest patents was granted to Fölsch and Howard in 1809. This was of simple construction and the interesting thing is that here, nearly 150 years ago, was a stylographic fountain pen, without valves, needle, or other feed device: simply a tube tapering to a very fine point.

In general, however, it was not until the invention of the spring or vibrating needle point that the stylo came to be regarded as a reliable writing instrument.

The modern stylographic pen conforms to certain basic principles, regardless of its manufacture, and it consists of three main parts: the point section, the barrel, and the cap.

The point section terminates in a tapering point, into which is skilfully fitted a very fine metal tube to receive the needle point. The barrel, into which the nib-section screws, has a tube of small diameter fitted in it. This tube is open to the atmosphere at one end by means of a tiny vent hole; the other end terminates in a short solid spindle upon which is fixed a coiled wire, extending forward in a straight line so as to pass through the point section and just protrude beyond the tip.

The success of the stylo as a writing instrument depends upon the air tube and the careful adjustment of the needle. The needle fulfils the same function as the "feed" in a fountain pen, and, unless it is correctly positioned, the ink supply will not be properly regulated. The air tube must be kept open, so care should be taken to ensure that the vent at the end of the stylo is never blocked in any way. An even flow of ink depends entirely upon the admittance of air through the vent and down the tube, to replace the ink as it is used.



Stylographic Pen Mechanism.

When the stylograph is filled, the ink feeds gradually down the needle point so that, on application to a writing surface, impressions may be recorded.

The cap is similar to the cap of a fountain pen, but it often contains a small indiarubber pad or cushion to protect the spring needle and to prevent leakage.

Like fountain pens, stylographic pens are made in the "regular" drop-filling and also self-filling patterns.

The most common fault with a stylo is that the metal tube at the point becomes choked, so causing an imperfect flow of ink or perhaps even a complete stoppage. For this reason a stylo should never be used for writing on a rough-surfaced or fluffy paper.

Another cause of dissatisfaction arises from the bending or extending of the spring needle. Customers should be warned to exercise the greatest care in handling this part of the pen, and not, in any circumstances, to tamper with it.

While the type of stylographic pen described above is in little use today, there has been a considerable development in drawing and stencil pens which are somewhat similar to stylographic pens in that a needle-type point is used. However, these really come under the category of drawing instruments, and are covered in the chapter devoted to drawing materials.

4. Ball-point Pens

The ball-point pen can perhaps be described best as a writing instrument in which a ball housed in a socket revolves freely as it is drawn across a surface, and, while it revolves, deposits a thin film of ink on that surface. The ball is usually of the order of 1 mm. in diameter.

Like most inventions, the idea of a pen using a rotatable ball instead of a nib is not new. It was originally patented in 1888 by a certain John Loud. But more than forty years passed before anyone invented a ball-point pen which worked efficiently. In the intervening period many inventors took out patents for ball-point pens, but none found a satisfactory solution to the problems which are inherent in such instruments.

One of the main difficulties lay in the construction of a suitable reservoir. It had been found that ordinary aqueous ink could not be used for a ball-point pen, for such ink would dry on the ball when the pen was not in use and the pen would not be ready for writing after a short idling period. In addition, such inks do not give a continuous and sufficiently dark trace.

The solution lay in the use of an ink of a much more viscous nature, with a solvent which was much less volatile than water.

The use of a viscous ink in turn produced another problem, that of replacing the consumed ink with air. In the ordinary fountain pen, the air flows in the reservoir through the feed system, but this was not possible with a more viscous ink. This problem was overcome by a scientist living in Buenos Aires who hit upon the idea of using a small diameter tube of capillary dimensions for a reservoir. Air could enter from the rear end of the tube and replace the ink as it was used up, and the ink would be prevented from flowing out of the open end by the capillary forces set up in the narrow reservoir.

This is a simple explanation of a complex phenomenon in which many other factors play a part.

This offered a workable solution to the problem, but placed a serious limit on the diameter of the reservoir tube. Subsequently a Danish inventor found it possible to employ larger diameter reservoirs by the use of a grease follower. A grease of carefully chosen properties will act as a plug behind the ink and prevent its leaking from the back of the reservoir. At the same time it will follow the ink down as it is consumed and allow the writing instrument to function in a satisfactory manner.

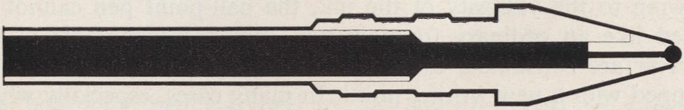
Both small diameter capillary tubes without grease followers and larger diameter tubes with grease followers are in use as reservoirs. The tubes are made either of plastic or of metal.

Owing to the viscosity of the ink, the ball-point pen cannot be refilled like an ordinary fountain pen. When the contents of the reservoir are consumed, the customer has to buy a new reservoir equipped with a new writing point. In many cases, especially where low capacity capillary reservoirs are employed, the reservoir is not replaceable, and the item is described as a "throw-away ball-point pen" for the obvious reason that the purchase of a new reservoir involves the purchase of a complete new pen. In many other cases, however, especially where larger diameter reservoirs are concerned, the reservoir is sold as a separate cartridge or refill, which is simply exchanged within the ball-point pen for the exhausted reservoir.

Many of the "throw-away" pens have an appearance similar to that of a pencil, and the point is exposed. The writing point of a ball-point pen is very sensitive to damage and, for this reason, the manufacturer makes provision for its protection in many cases. Earlier ball-point pens had the external construction of fountain pens with screw-on caps, though it subsequently became more common for push-on caps to be used. Most refillable ball-point pens nowadays are provided with a retracting mechanism so that the refill point is withdrawn inside the front of the barrel when not required for writing purposes. This mechanism is operated either by pushing down or turning the cap portion of the pen, or by a button protruding through the top of the cap, or by pressure on the clip attached to the cap. In some cases, the retracting mechanism is arranged to rotate the refill so as to reduce the chances of the point always being used for writing on the same part of its circumference.

Earlier ball-points were constructed to use smooth balls, and smooth stainless steel balls are still the most frequently used. Tungsten carbide has also come to be used because of its greater hardness and resistance to wear. Finally, "textured" balls, usually of tungsten carbide, have come into use. The surface of these balls is covered in minute pores. These increase the ink carrying capacity of the ball surface and improve the grip which the ball exerts on the writing surface.

The material used for the housing which holds the writing ball was originally a copper alloy, either brass or, better still, bronze. It was found that wear occurred during use and that it was the housing metal which became worn away rather than the ball. This resulted in a variation of ink flow and deterioration of performance. A considerable improvement was achieved by substituting stainless steel for the housing metal. This much harder-wearing material remains comparatively unchanged during the life of the refill, and so increases the chance of consistent and satisfactory performance. This is of particular importance where large refills are used, many of which carry enough ink for eight miles of continuous writing.



Cross Section of Ink Unit in Expendable Type Ball Pen.

Shortly after the ball-point pen finally became established on the market, different ball sizes came into use to simulate the situation, already existing with the fountain pen, of varying nib grades. The range of ball sizes now extends from 0·6 to 1·4 mm. Blue is the most popular colour of ink, but black is also widely used. Other colours are available, though there is comparatively little sale outside the two mentioned above and red. It is proper to make some comments here about ink, because, in the case of ball-point pens as opposed to fountain pens, the properties of ink and instrument cannot be distinguished by the public. The first post-war ball-point pens, which were sold to a fairly wide market, used an ink which was essentially a solution of dyes in an oil medium, usually oleic acid. Extravagant claims were made for these instruments, including the fact that, owing to the oily nature of the ink, they would write in water or, at least, on wet paper. The extravagance of these claims won the ball-point pen a poor reputation which was not overcome for some time. This oily ink is now used only in the very cheapest of ball-point pens and it has a number of disadvantages. Because the oil does not dry, it will easily off-set; this means that a facsimile of a signature could easily be taken and forgery was made easy, so that banks were reluctant to accept cheques signed with ball-point pens of this type. The only dyes which were suitable for use in the medium had poor light stability, so that writing exposed to daylight would sometimes fade and, in extreme cases, disappear.

These disadvantages have been completely overcome by changing over to inks based on either glycols or benzyl alcohol. The use of these solvents has, in turn, allowed the use of very much better dyes which are much more resistant to exposure to light. Ball-point pens are now acceptable writing instruments for most purposes, although it is still true that no ball-point ink is permanent in the sense that an iron-containing aqueous record ink is permanent, since the latter produces a metallic deposit in the fibres of the paper which can never be removed.

Multi-Colour Ball-points

Ball-point pens are now available with a choice of two, three or even more colours. These instruments are equipped with the appropriate number of small capacity refills carrying the different coloured inks. There is a retracting mechanism and some sort of colour code, so that the chosen colour can be put forward into the writing position.

5. Felt and Fibre-tipped Markers and Pens

The early industrial marking instruments were relatively bulky articles made of glass or metal, and they contained a dye solution which could be used for marking by means of a coarse felt tip, rather like a wick.

Two developments have been felt-tipped drawing sticks and fibre-tipped marker pens. The latter have become more important because their neater design, similar to that of an ordinary fountain pen, and finer writing point give them a wider range of application.

Some felt markers are refillable, others are not, and the same remark applies to fibre-tipped pens, which either are of the "throw-away" type or are refillable with a refill combining a new writing point in the same manner as a ball pen is re-filled.

There are two basic kinds of ink, and the difference between them and the purposes they will serve need to be understood.

Water Colour Markers and Pens are primarily used to write, mark, colour and sketch on paper surfaces, although they can be used on other surfaces if time is allowed for the mark to dry. The colours are made from suitable dyes dissolved in water, and the marks can be more or less easily removed with a damp cloth or by washing, depending on the type of surface of the material used.

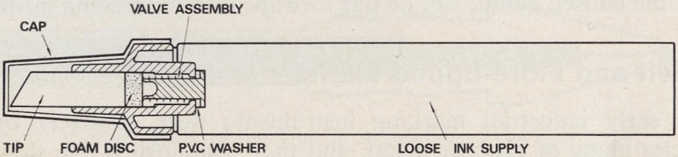
The tip is made either from felted wool or by bonding together strands of suitable synthetic fibres.

Permanent Ink Markers and Pens can be used for all types of marking, lettering and sketching. They must be used if the mark is intended to be "permanent"—in other words, if it is expected to last for a long time and particularly if it is exposed to washing or rain. Black will withstand exposure to sunshine, but other colours will fade more or less rapidly.

"Permanent" ink is made with a volatile spirit base plus resins and dyes enabling all types of surfaces to be marked—paper, wood, glass, leather, metal, plastic-film, etc. If the surface is porous, the ink will permeate and cannot be removed.

There are two types of "permanent" ink—"transparent permanent," in which the dyes are dissolved in the base, and used for all but black or dark surfaces, and "semi-opaque permanent," which contains a pigment held in fine suspension. Semi-opaque permanent inks are used on black or dark surfaces because the pigment forms a coating which reflects light and so the mark becomes visible against the dark background.

The felt tip is made of felted wool fibres. Various shapes and sizes are available so that a wide variety of uses is made possible.

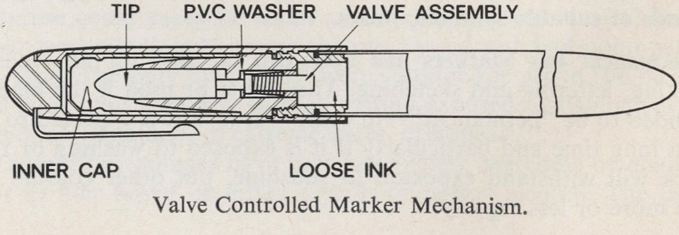


Felt Tip Marker.

If the tip dries out because the cap is left off, it should be immersed for a few minutes in a suitable solvent as recommended by the manufacturer.

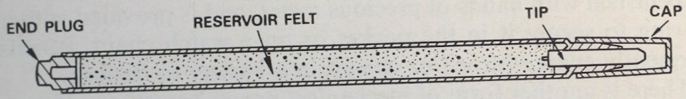
There are two methods of controlling the ink supply—one with capillary action, the other by means of a valve. Both methods are illustrated and explained below. There are two types, one designed to be refillable, the other not. With refillable models, it is unwise to refill with other than the manufacturers' recommendation, because all elements of ink and marker or pen must be compatible. A refillable model should, naturally, provide for the replacement of worn tips.

Valve-controlled markers and pens interpose a valve between the tip and the ink supply. When the pen is not in use, the valve is closed to prevent evaporation and loss of ink. Depression of the tip opens the valve and allows the ink to flow to the tip. The valve can be operated to "meter" and control the ink supply so that a wide variety of results is possible.



Valve Controlled Marker Mechanism.

Capillary action markers have no valve control. The barrel contains an absorbent material which is saturated at the time of manufacture or after purchase. The absorbent material is in direct contact with the back end of the tip and the ink travels to and through the tip by capillary action as tea travels through a sugar cube. Air channels are designed into the marker so that as the ink volume is diminished it is replaced by air. This capillary action is continuous, so good design is needed to prevent evaporation. Ink will also tend to vaporize and escape through the wall and cap. The better the materials used, the smaller the loss from evaporation.



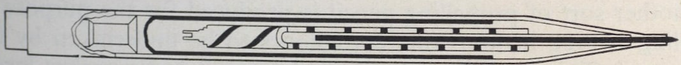
Capillary Action Marker.

6. Propelling Pencils

Propelling pencils were originally made for the jewellery trade and were expensive because they were hand-made throughout, their barrels being of gold, silver or ivory.

The mechanism of a propelling pencil is usually based on the operation of a spiral screw, and most modern propelling pencils are of this type. In some, the cap has to be twisted to propel the lead forward, while the barrel is held firmly. In others the barrel is twisted while the tip is held. Early propelling pencils had thick leads which required sharpening, but nowadays they are fitted with thin leads and no sharpening is necessary.

The lead has to be gripped to prevent it from slipping back into the barrel when a writing action takes place, and this operation is performed by two alternative or combined mechanical devices. In one case, the lead is inserted into a clutch at the end of the inner spiral mechanism, which allows the lead to be propelled, repelled, or expelled through the nozzle or tip. In others, the lead is inserted from the open end of the barrel, the gripping effect is confined to the tip, and a plunger controls the propulsion. Here there is no automatic repel operation. Yet again, in some pencils there is a clutch in the mechanism and a further clutch in the tip, formed by slitting the tip or by shaping it.



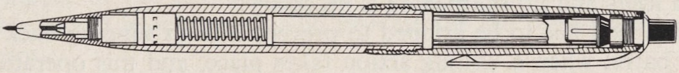
Propel/Repel Pencil Mechanism.

Propelling pencils are fitted with spare leads which are contained in a magazine at the cap end of the barrel, and it is usually necessary to remove the cap in order to obtain refills. Some pencils are provided with an indiarubber concealed under the cap.

While mechanisms are always made of metal, the barrel or casing of propelling pencils may be of plastic or metal—sometimes a precious metal such as gold or silver, or sometimes electro-plate, chromium, or even ordinary gun-metal. Often a plastic pencil is embellished with bands of precious metal, and is provided with a clip or ring to secure it in the pocket or on a watch chain. Pencils are frequently engine-turned or chased in a variety of designs.

There is another form of mechanical pencil known as a "**repeater**" or "**step by step**" pencil. In this type, when a spring is compressed, lead is forced forwards into the tip. This pencil is usually provided with two independent clutches. An inner clutch takes hold of the lead and grips it firmly when the pencil is in use. Pressure on a stud cap at the end of the pencil operates against a spring which causes the inner mechanism to be propelled forward together with the lead, and this forward propulsion forces the lead into a clutch housed inside the tip. At this point the lead is held by the tip clutch and the inner clutch opens its jaws. Upon release of the pressure from the stud cap, the mechanism travels back along the inside of the pencil with the clutch jaws still open and at the end of the movement the jaws close once more upon the lead.

When the mechanism is at rest, the lead is thus held firmly at the tip and again by the clutch jaws inside the pencil. It is due to the propulsion movement that the technical term describing the mechanism is "step by step."



Repeater Pencil Mechanism.

Magazines in this type of pencil carry a dozen or more leads, and as one is exhausted another takes its place without any reloading being necessary. Leads are fed from the magazine into the clutch by the force of gravity; therefore, in operating the pencil the tip should be held with the point downwards.

These pencils are known under a variety of names, such as repeater, ejector, press stud or push pencil, but they all incorporate similar mechanical ideas.

Another sort of propelling pencil is produced for the purpose of enabling writing in four different colours to be undertaken by the one pencil. This is of the propel-repel type; it has a rather larger barrel than usual, which houses four separate clutch units into each of which a lead may be inserted. A mechanical device, which varies as between different makers, allows each clutch unit to be operated independently, so that the particular coloured lead required is fed through the point section ready for use, while the other three remain static inside the barrel. The clutch unit is restored to the barrel either by means of a return spring or by manually operated mechanism.

Leather Goods

Stationers today are selling an ever-widening range of leather goods and it is therefore essential for them to acquire some knowledge of the various leathers used and of the classes of goods available that are suitable for both the commercial and the fancy goods trades.

1. Leather

Eye Appeal

The first step in selling goods to the public is to catch the eye and to draw attention to the merchandise. Modern leathers do this in two ways, firstly by being available in a wide range of colours suitable for modern fashion and design and secondly by returning to the genuine leather look, as found in aniline hides and other similarly finished leather—*e.g.*, pigskin. Fine leathers have eye appeal and appeal aesthetically to the senses. They suggest gracious living and dependability.

Touch or Handle and Texture

This feature of leather can be controlled by the tannage. On the one hand, there are stiff hide leathers for luggage, which are vegetable-tanned, and on the other, softer hides and sheepskins for nappa leathers which are made soft by chrome tanning, or by chrome retannage of vegetable-tanned leathers (semi-chrome leathers). In addition the range of oils, fats and waxes used on leather is continually expanding and very soft supple leathers can be made as required.

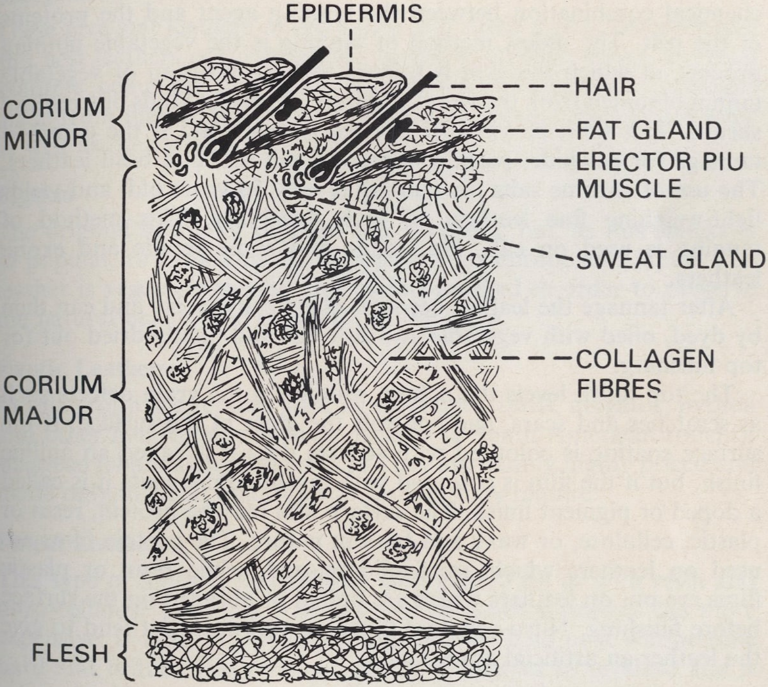
Durability

Leather goods have a long life. They will stand up to hard work, ill-treatment and wide variations of climate without failure. Provided that the article is kept clean and the leather is fed regularly with waxes and proprietary feeding products, it will last a long time.

Top Finish

The top finish on this type of leather has to be fast to wet and dry rubbing. The use of nitro-cellulose lacquer finishes ensures that good water-resistance is obtained, and this type of finish can be kept clean by sponging it with warm water and finally polishing with a dry cloth. The leather dresser has to consider also the possibility of colour coming off leather goods and staining clothing, gloves, etc. For luggage and large leather goods the question of fastness to abrasion is important, and recently the introduction of polyurethane scuff-resistant leather finishes gives promise of big improvements in this direction. The use of protein finishes, based on casein and albumen, is still found on pigskin and reptile leathers and accounts for the tendency for this type of leather to become dirty very easily. The use of silicone wax polishes gives good protection to this type of leather.

Skin Structure


EPIDERMIS
HAIR
FAT GLAND
ERECTOR PIU MUSCLE
SWEAT GLAND
COLLAGEN FIBRES
CORIUM MINOR
CORIUM MAJOR
FLESH

Ox-Hide.
Vertical Section—Diagrammatic—Enlarged.

Every type of hide or skin has three main layers:

(1) the **corium minor** or **grain layer** of fibres closely knitted together. The nature of this layer decides the appearance of any given type of leather;

(2) the **centre layer** or **corium major** is the fibrous layer which decides such factors as durability and tensile strength. In hides the corium major is fairly densely woven, but in sheepskin it is only loosely fibred and very soft;

(3) the **flesh side** on which suede surfaces are normally prepared. For suede leathers the flesh side must be free from flay cuts and vein marks.

The raw materials of the leather industry are largely the by-products of food and wool production, and the tanner is not able to influence the production and availability of his raw stock. The hair or wool is removed by treating the stock with lime and sodium sulphide, and, after neutralization of these alkalis, the hides or skins are tanned or converted into leather. The process of tanning involves chemical combination between the tanning agent and the proteins of the pelt. The oldest method of tanning is the vegetable tanning process, in which the skin is treated with an infusion of vegetable tannin obtained from the wood and bark of several kinds of trees and shrubs. This tannage yields firm hard leathers and is the common tannage for cowhide, pigskin, morocco, pin seal and basil leathers. The use of chrome salts for tanning is only 50 years old, and yields light-weighing fine leathers of high durability. This method of tanning is used on calf, kid, suede and some reptile and exotic leathers.

After tannage the leather becomes chemically stable and can then by dyed, oiled with vegetable and fish oils and finally dried out for top finishing.

The top finish levels the colour, minimizes the grain defects such as scratches and scars, and controls the gloss of the surface. If the surface coating is coloured with soluble dyes it is called an aniline finish, but if the film is coloured with insoluble pigments it is called a doped or pigment finish. The surface film may be protein, resin or plastic, cellulose, or waxy and fatty in nature. The protein films are used on leathers which are friction-glazed, while resin or plastic films are put on leathers which are buffed or abraded on the surface before finishing. Nitro-cellulose films are very fast, but tend to give the leather an artificial appearance.

2. Types of Leather

Cowhide

Cowhide is commonly used for luggage, shopping bags, brief cases and the heavier types of handbag. It is available in aniline finishes, smooth pigmented leathers, nitro-cellulose finish, antique finishes and speciality leathers such as coach hide. It is a tough, durable leather and stands up to hard wear.

Calf

This leather is mainly used for handbags and high-quality small leather goods. It is an expensive leather with a pleasing feel and texture. It is available as black box calf, coloured box-grained and willow-grained calf, and in small quantities with a high-quality suede finish.

Goat

The use of morocco or vegetable-tanned goatskin is popular for bags and small leather goods. The usual leathers met with are hard-grained goats with a fine grain, as well as various types of levant goat with a somewhat larger and bolder grain.

Sheepskins

These give soft leathers of the nappa and suede types. The strongest and best leathers come from hair or coarse-woolled sheep, a typical example being the Persian or East India tanned sheep. Leathers made from fine-woolled skins are soft and spongy and do not wear as well as the Persian type.

Pigskin

The original source of pigskins was Scotland, but, as this leather is so popular, raw pigskins are imported from Europe and Japan. The leather is vegetable-tanned and aniline-finished in order to preserve the natural beauty and character of the grain.

Exotic Leathers

In this group are reptiles such as crocodile, lizard, alligator, python and other fine leathers such as peccary (a South American rodent), shagreen (shark skin) and ostrich. They are mainly highly priced and made only in small quantities as fashion may require.

Patent Leather

This type of finish is made either with linseed oil or with resin and nitro-cellulose products. The genuine oil-based linseed is the more expensive; it must not be allowed to become cold or it will become hard and brittle. The synthetic patent is cheaper to produce and is not so likely to crack.

Leather is keeping its place as a material for modern living and is popular with modern designers of footwear, clothing, leather goods, furniture and decoration. Research by the leather industry is paving the way for new and improved leathers.

The type of goods likely to be of interest to stationers may be divided into brief cases etc.; desk sets; flat leather goods; leather-bound books and fancy leather goods.

These will be dealt with individually. Another range namely luggage, might conveniently be included, but as it is so wide and varied, and as it is only stocked by, a limited number of stationers it will not be included.

3. Brief Cases etc

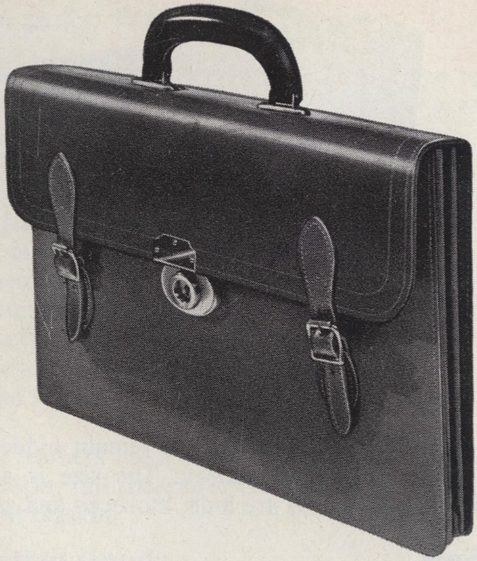
This group of articles can be very roughly divided into four sections based on the requirements of the public. They are as follows:—

Flat underarm cases, fastened by means of a zip, on one, two or three sides. These cases are made also with pockets inside or out and some are divided to make two compartments. Locks are often provided for security. They are also obtainable with telescopic handles. Used mainly for carrying odd documents or papers, they have a limited capacity. The principal leathers used are hide, morocco (goatskin) and pigskin. The normal size is approximately 16 in. × 12 in.

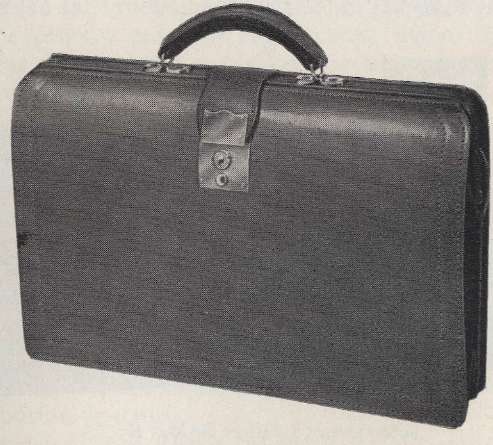
Underarm Case.

Brief Cases (sometimes referred to as **Commercial Folios**): This is a much more substantial article than the underarm case and is designed for carrying large files and books, etc. Divided usually into one, two or three compartments, they can also be obtained with a zippered pocket on the back. The case is fastened by means of a lock (usually three-positioned to allow for expansion) and has also two short straps and buckles or long straps round the case. They are mainly made from cowhide, and to a small extent from morocco and pigskin. Their size is approximately 16 in. × 11 in.

Overnight Brief Cases: These are designed to carry the requirements for an overnight stay as well as business documents. The case is made on an iron frame covered with leather, which enables it to open wide. The inside is divided into three; the centre compartment, to take overnight kit, is the widest, and the other two inside pockets are for carrying documents. The case is closed by means of a single centre strap and lock. These cases can also be obtained with a zip pocket on the outside for additional papers. They are mainly made from cowhide, as well as morocco and pigskin. Their usual size is 17 in. × 11 in., but they can also be obtained in larger sizes. They are particularly suitable for use by firms' representatives as sample cases.



Brief Case.



Overnight Case.

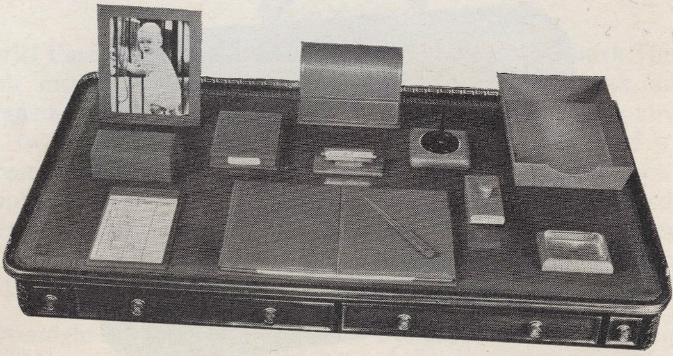
Executive Attachés: These are cases of a more recent type that is becoming increasingly popular. They are made on a solid foundation —mainly plywood—covered with leather; they are oblong in shape and are generally closed by means of two locks. The inside usually consists of pockets to take files or papers in the lid, and the cases are produced in sizes from approximately 2½ in. to 5 in. in depth. The large size often has a divider made in the form of a blotter; this

Executive Attaché Case.

enables the overnight kit, if carried, to remain hidden, as well as providing a solid writing foundation. The size is approximately 17 in. × 12 in. Leathers used are hide, morocco and pigskin.

4. Desk Sets

The principal item is the blotting pad, and the two most popular sizes are demy folio 11¼ in. × 17½ in. and demy flat 17½ in. × 22½ in.



Selection of Leather Bound Books.

While those made for commercial use are detailed in the chapter on Stationers' Sundries, it should be noted that blotters in this range are of higher quality, with better bases and selected leathers to match any of the other desk set items. The demy folio size is obtainable with corners, military ends or complete flaps, whereas the demy flat is generally obtainable only with corners or military ends, owing to the fact that if flaps were fitted to the larger size they would take up an enormous amount of room on the desk. Moreover it would be difficult to get perfect flaps in leather owing to the size of skins required.

The number of additional desk set items which go to make desk sets varies from manufacturer to manufacturer, but generally covers most customers' requirements.

A basic set might be considered to consist of a blotting pad, letter opener, memo pad and perpetual calendar, to which can be added a variety of items depending on individual taste and requirements. These consist of letter trays, stationery racks, rocker blotters, desk pen units or pen trays, telephone indexes, engagement pads, address books, cigarette boxes and ash trays. These various pieces normally come individually gift-boxed and can be bought separately.

Most manufacturers also produce "presentation sets" consisting of a blotter and four or five other selected items which are boxed as a unit.

The normal leathers used, commencing with the least expensive, are split sheepskin, full sheepskin or basil, morocco goatskin, hides of all types and pigskin.

5 Flat Leather Goods

This term is generally given to personal items such as wallets, notecases, french purses, card-cases, passport cases, key cases, etc.

The least expensive are "cut edge" cases, where the pieces of leather making up the cover or pockets are simply cut and stitched together. Next are cases which are known as "semi-solid," where the outside cover has a turned-over edge, the pockets being cut edge. Top quality are fully "turned edge" cases, where all edges, including pockets, are turned over and also sometimes stitched.

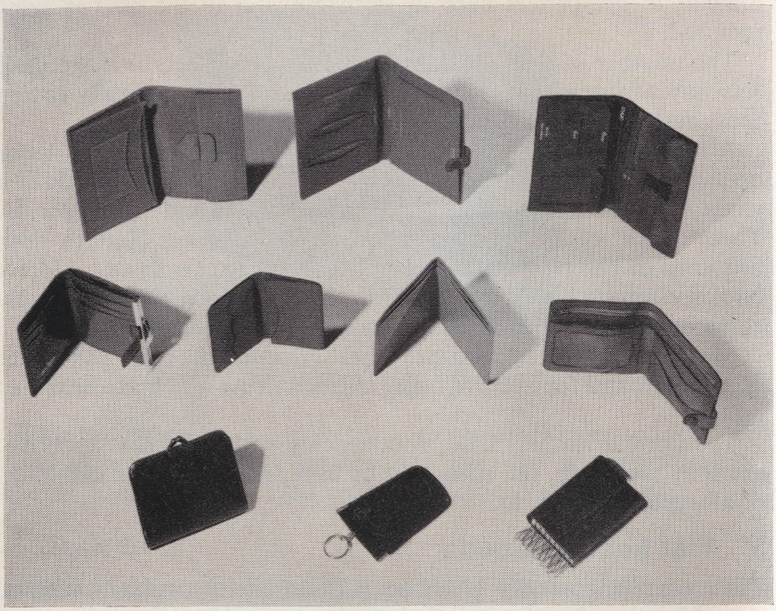
Cheaper qualities of **Wallets** and **Notecases**, besides being made from the lower-priced skins, are often more bulky and have more pockets and fittings, such as zip closures. The more expensive tend to be slimmer and more traditional in design.

Wallets are available with or without deep pockets down the back, opening either at the top or at the side, with a flap and strap and bar fastening. Notecases are generally available with or without a strap and button fastening.

For the ladies, **French Purses** on metal frames and combination notecases with purses are most popular.

Card-Cases, besides having pockets for visiting cards, often incorporate season-ticket windows, pockets for stamps and sometimes refillable memo pads.

Passport Cases, in addition to having the pocket for the passport itself, are generally fitted with pockets for foreign currency, letters of credit, air and landing tickets, and sometimes incorporate pockets or holders for travellers cheques and even currency converters.



Selection of Flat Leather Goods.

Key Cases are made with a number of key-rings, usually 4, 6 or 8; sometimes these are removable. The cases have either button or zip fastening.

The most popular leathers for these types of goods are hides, goats and pigskins; for the more expensive, calf, kid, ostrich and reptile skins are used.

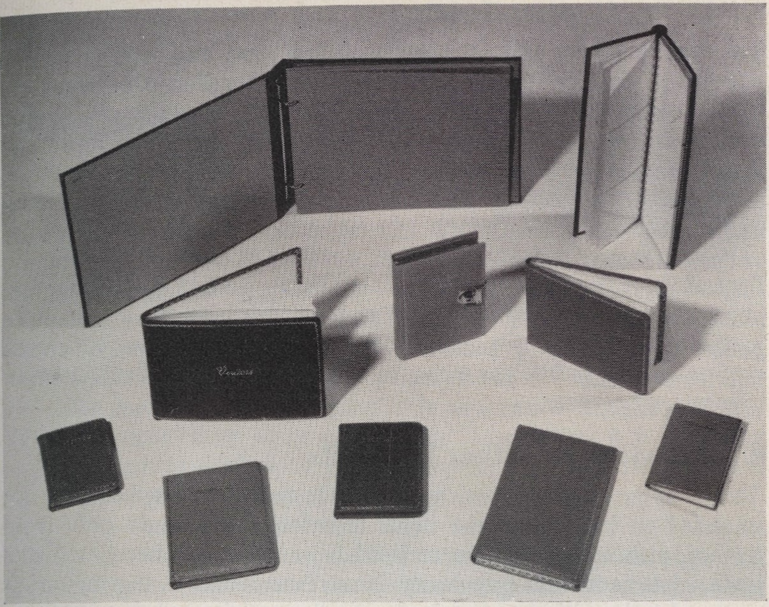
6. Leather-bound Books

The luxury finish and hardwearing qualities of leather make it very suitable for the binding of a large variety of "blank books"—books in which one can write for special purposes.

Just as the publishers and binders of the printed word have used leathers for their better binding, so have the manufacturers of "blank books," in sizes for both pocket and desk use, and suitable for either the commercial or social trade.

To list and detail all the various types would not be possible, but mention is made of just a few.

Address Books, **Diaries** and **Notebooks** are in great variety and demand. **Visitors' Books** of this quality are important for obvious reasons. Sometimes they are required with perfectly blank pages instead of the usual printed style. In this case important guests or



Selection of Leather Desk Items.

visitors are required just to sign their names, and this type of book is called a **Signature Book**. For recording of birthdays there are **Birthday Books**, which are usually printed with quotations or extracts from well-known books or plays. **Five Year** and **Any Year Diaries** are different from the ordinary diary in that they are undated. Days, and sometimes months, are printed but not the actual date, and, as may be expected, they are often fitted with a lock.

Albums are produced in many sizes and bindings for a variety of purposes, the main ones being for photographs, postcards and stamps. Some are quite simple in design, and more or less of a utilitarian style, while others are much more elaborate and possess padded, tooled or embossed covers. There are two main types:

(*a*) The slip in, and (*b*) The paste in.

The former have openings cut to standard photograph or postcard sizes and the latter are fitted with guards at the spine so as to compensate for the additional bulk imparted to the book by the inserts.

Pages for stamp albums range from plain sheets to printed ones, often showing reproductions of some of the interesting, valuable or popular stamps.

The leathers used for all the books cover the whole range of leather available.

7. Fancy Leather Goods

The variety of goods in this group is immense and it is quite impossible to mention them in detail. They include ashtrays, barometers, clocks, thermometers, brushes and brush sets, cigarette cases, dice shakers and sets, dressing-cases, jewel cases, manicure sets, motorists' items, playing card sets, shoe-shine sets, shoe-lifts, spectacle cases, spirit flasks, stud boxes, tobacco pouches, wet packs, writing cases and novelties in great variety.

Pigskin is very popular with men, possibly as a follow-on to its use for saddlery. For ladies' articles calfskin, morocco, kid, sealskin and crocodile are preferred. Cowhide and sheepskin find a useful place in the manufacture of a general line of goods, appealing to a wide section of the public for gifts, birthdays, weddings, anniversaries, presents, prizes, etc.

8. Substitute Leather Materials

This chapter has dealt with goods made from leather, but it is not intended to imply that the items mentioned are made only from leather, although it will be realized from what has been said that leather has enormous popularity. Nevertheless many other materials are used today either to produce a similar article at cheaper cost, or because there is something especially suitable about the material for the product for which it will be used. Such materials may be plastic- or fibre-based, and there is no doubt that many of them are attractive and economical. It is therefore the sales assistant's responsibility to learn as much as possible about these materials from the source of supply, in order to be able to sell knowledgeably and with the assurance or otherwise that a particular material is perfectly satisfactory for the article and its use.

CHAPTER 5

Stationers' Sundries

The stationer's stock comprises an almost bewildering range of sundry items. It is probably greater than that of any other trade except, perhaps, that of ironmongery. To the inexperienced this array of items is formidable, to say the least, yet it is upon such items that a large proportion of the stationer's business is dependent. It follows that a major part of the sales assistant's day will be spent in selling such stock. Therefore it is in the interest, of the assistant, retailer and customer, that knowledge of the use and availability of this range is acquired as soon as possible. Invariably, it is with the classes of goods dealt with in this chapter that the sales assistant experiences introduction to the industry as a whole.

What are stationers' sundries? A superficial glance through this book will give some idea of the various categories of products that, in total, make up stationery and office equipment sundries.

Each category is an industry in itself, and in many cases equipment requires ancillary supplies to enable it to function. For example, on the one hand a basic raw material is paper, and several classes are made on which to write. For this purpose, pencils, pens and ink are required. On the other hand there are business machines, typewriters, adding machines, etc. In order to use them, carbon paper, ribbons, and a host of other commodities are needed. Almost without exception, the use of one article means the employment of another. The vast majority of these items make up what are termed stationers' sundries.

In a previous chapter, mention has been made of shops that specialize in certain types of equipment. In just the same way the stationer can specialize by selling sundry stationery items. Of course, the larger shops sell both equipment and sundries, but often, although the consumer may purchase the initial equipment from a specialist, it is from the general stationer that he purchases his sundries.

Practically every item can be classified into one group or another. The group may comprise articles for use with machines—*e.g.*, typewriting accessories. Alternatively it may include items that are grouped simply by reason of their relationship with each other.

1. Writing Accessories

Pencils

Pencils are put to many uses and accordingly they are produced in a very wide range. There are two principal features comprising a pencil:—

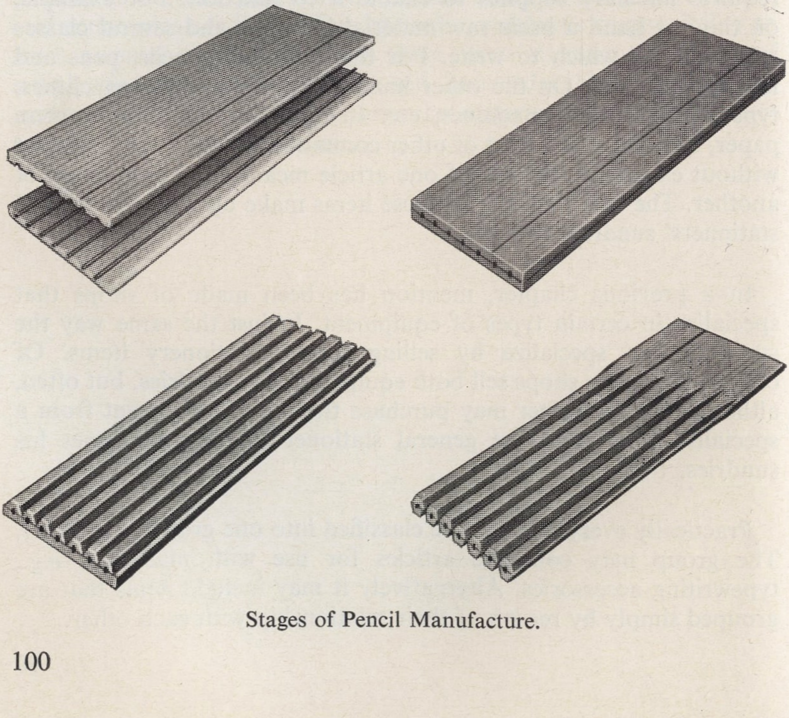
(1) the graphite with which the drawing or writing is done, and

(2) the wood in which this graphite is encased.

As the quality and type of pencil is determined principally by these features, a word or two must be said about them.

Graphite

A pencil "lead" is not lead at all, but finely ground graphite. The most suitable comes chiefly from Mexico, Ceylon and Korea, and is imported in powder form. This graphite is finely ground and mixed with specially prepared clay to act as a binder. The whole is then mixed with water and again carefully ground to ensure that the pencil, when finished, will be smooth, silky and free from grit. The substance is then put under hydraulic pressure, where it is squeezed out through a sapphire die into strips of the required shape and size. These strips are then fired in a furnace under intense heat and steeped in wax for greater smoothness and strength.



Stages of Pencil Manufacture.

Wood

The essential requirement of the wood casing is that it should whittle easily and evenly. The wood in all good pencils is usually American "incense cedar." The finest grades are straight-grained so that the wood will not warp, free from knots and resin, easy to sharpen but strong. The wood is received in small slats about 7¼ in. long by about ¼ in. thick and in widths varying from ¾ in. to 2½ in. A machine cuts grooves along the lengths, the depth being half the thickness of the lead they are to contain. The slats are then glued and the strips of lead placed in one, with another slat placed on top. After drying under pressure they are then machined to shape, sandpapered, coloured and polished, all by automatic machinery. The final operation is to stamp the maker's name, and then after inspection they are ready for packing, usually in 1 dozen, but also in 6 or 12 dozen to a box.

Degrees

According to the "degree" of a pencil, the mark that it makes may be soft or hard, with a varying degree of blackness. These degrees are obtained by varying the proportion in which graphite and clay are mixed. A large proportion of graphite produces soft degrees, whilst a larger proportion of clay produces hard degrees. Normally there are 17 degrees of pencil, ranging from 6B—the softest—to B, then HB and F, which are medium, to the hard degrees H up to 9H.

"*Soft*" *Degrees*

These are 6B, 5B, 4B, 3B, 2B, and are used by artists for sketching and shading work. Density of blackness is important, as is of course smoothness, particularly when used for shading. Being soft, these degrees wear down too quickly for general use. They are useful, however, for correcting proofs or marking up newspapers.

"*Medium*" *Degrees*

B is suitable for shorthand work and general use. HB is the degree for general use, being black enough for clear writing but hard enough not to wear down too quickly. F and H are a little harder and not quite so black, and they give good carbon copies.

"*Hard*" *Degrees*

The most popular are 2H, 3H, 4H, and 6H, and they are used principally by draughtsmen. Too hard for general use, they are made for writing on tracing paper and cloth, and special draughting film. For general technical drawing 2H is the most popular.

7H, 8H and 9H are extremely hard and are used mainly by stonemasons, lithographers, or engineers for marking hard surfaces such as stone, metal, etc.

Quality

As with all products, there are varying qualities of pencil. The cheaper grades are usually available in 2B through to 2H, with HB as the most popular. These are suitable for scholastic or industrial use, where no particular requirement is needed. Medium grades are used mostly in offices, schools and nearly all technical colleges. The range usually is 4B through to 4H, and again the most popular is HB. Best quality pencils cover the whole range of degrees. Particular mention must be made of the **drawing office pencil** which comes into this category. Pencil quality is of vital importance to the draughtsman, because of the nature of his work and because drawings normally are reproduced by one of the reproduction processes. The lead must give lines that are:

(1) opaque (light resistant);
(2) clean and sharp;
(3) completely erasable.

The grading must be evenly spaced and consistent (*i.e.*, a 2H of the same brand must always be of the same hardness and blackness). The point must not wear down too quickly, crumble, or break under pressure: the point can be $\frac{1}{2}$ in. long, sharpened to a needle or a chisel (flat) point, and breakage involves a loss of valuable time as well as being an inconvenience. Point strength is achieved by extra-fine grinding, making the lead structure stronger and more compact. Also a bonding process may be used, whereby lead and wood are bonded into a stronger than normal unit.

Other Types

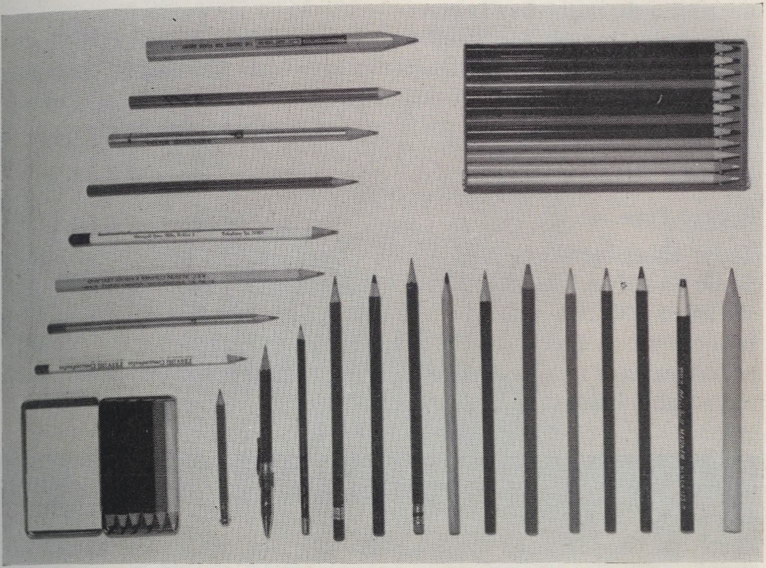
Reference has so far been made only to blacklead or graphite pencils, but there are others equally popular for their particular purpose:—

Indelible Copying: Made in a variety of colours, these provide a firm indelible marking for manifold work, or a source of direct colour wash for the artist and draughtsman.

Carbon and Charcoal: Used on rough grained papers by some artists, these pencils give bold masses or fine shading with a matt effect.

Pastel Pencils: These give similar results to the above, but in colour.

Coloured Pencils: Cheaper qualities are for scholastic use and are often sold in packs of 6, 12 or 24, half or full length. They should be non-toxic, as educational authorities will accept for use in schools only pencils of guaranteed purity. Better qualities include strong, hard, thin coloured leads which can be sharpened to a fine, long-wearing point. These features, together with a wide colour range, have created a large demand from draughtsmen, accountants, teachers, children and general offices. They can be obtained in sets as well as individual pencils.



Various Stock and Advertising Pencils.

Wax Pencils

Materials such as cellophane, acetate, perspex, glass, metal, etc., need special types of pencils. These are of the wax variety and can be detailed into three main types:—

(1) Wooden pencils with a soft waxy lead. Usually available in about 6 to 8 colours. The mark can be wiped off with a soft cloth. Sharpeners should never be used for these as the lead is too soft and will break easily. They are best sharpened by a razor-blade or knife.

(2) A similar type of lead, but cased with spiral paper wrapping. Sharpening is effected by pulling a thread fixed into the wrapping which strips off the paper to expose the lead.

(3) Thin, less waxy leads, some water soluble, and erasable with a damp cloth. They are easier to sharpen than previous types, and give a finer but less bold mark. They are less affected by heat, which is an advantage for use on films and overhead projectors.

Advertising Pencils

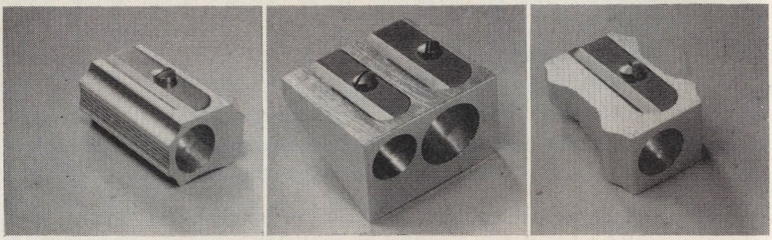
Some makers will print pencils with the name of the customer or with an advertising slogan. Makers will supply full details, but it is worth remembering that all wording must be carefully checked and that there are limits as to how much wording can be printed legibly.

In conclusion, the art of selling pencils is to sell the right pencil for the right job. In the hands of a lithographer a 7H pencil is a precision instrument, but in the hands of a schoolchild it would be completely wasted. All pencils are marked with the degree and this, coupled with knowledge of the customer's requirements, will ensure that the customer gets the right type of pencil for his purpose.

Pencil Sharpeners

Pocket Type

These sharpeners are made from plastic, brass, and metal alloys. Some have two blades to allow a finer point sharpening, and others are fitted with containers for the shavings, which make them suitable for desk use. A special type is available for the sharpening of "clutch" pencil leads or compass leads. The good-quality makes usually have replaceable blades.



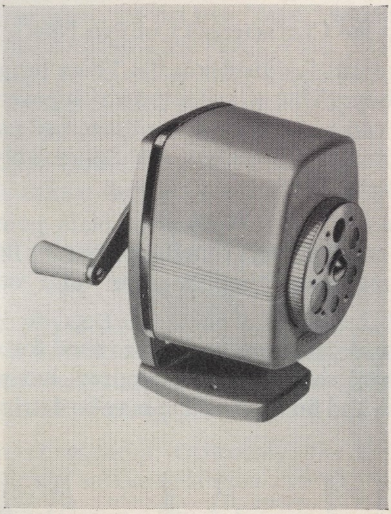
Pocket Type Pencil Sharpeners.

Rotary Desk Models

Hand-operated rotary pencil sharpeners: These can be fitted to any flat surface, desk, work-table or wall by means of clamps, screws or vacuum action. Some rubber-based desk models also operate very efficiently if just held by hand. Shavings are collected either in the body of the machine or, in the better models, in a transparent plastic container so as to indicate when emptying is necessary.

The range is wide and includes those which will take only standard pencils, those with a selector dial for all sizes, and those which have a six-jaw chuck-feed to take standard or any size and to hold the pencil firmly in position at the correct pressure. Another refinement on the more expensive models is the point adjuster, which gives a point of any length, from stubby to fine, and will sharpen, in addition to pencil leads, such things as pencil erasers. The machines have an automatic action by means of which the cutting process stops as soon as a perfect point has been formed, allowing the cutter to run free and so prevent pencil waste.

The cutters, which are either single or double (for longer life), are normally made from specially hardened, rust-proofed steel, with precision-ground cutting edges. The better the quality of the cutter, the longer its life, and recent improvements in manufacture, giving a true undercut, have almost doubled the life of some cutters. The cutters should not be re-sharpened but are very easily replaced.



Hand Operated Desk Sharpener.

Electric pencil sharpeners: These embody many of the features of the hand-operated rotary type, but are not quite so much in general use. Power is by means of batteries.

Pen Nibs

Packaging and Display of Pen Nibs

Pen nibs are normally sold in boxes containing quantities of one gross, half gross, quarter gross and sometimes less. Some patterns, usually drawing, mapping and lettering, are sold on cards of one dozen, sometimes with a penholder.

Penholders are available in many different sizes and styles, the most common materials for the handles being wood and plastics. It is important to see that the correct type of holder is sold for the type of nib it has to fit.

The most practical way to display pen nibs is in a counter display case which acts as a dispenser. These are obtainable from most manufacturers.

General Remarks About Pen Nibs

Pen nibs (or pen points) are made in many different styles and from various materials in order to produce the characteristics appropriate to the specialized use to which they are to be put.

These notes are a brief guide to these characteristics and the factors which determine them. However, nibs for use with *fountain pens* are dealt with in chapter 3 on Writing Instruments.

Factors Governing the Characteristics of Pen Nibs

(*a*) *Point width* (Fig. 1, dimension P): These range from 0·002 in. to 0·115 in. and above. This is the factor which governs the minimum width of line that can be drawn with any specified pattern. Generally speaking, the point width cannot be appreciably less than the thickness of the metal used.

(*b*) *Type of point* (Fig. 1): Normal or plain points are the most common and are nearly always found on pen nibs for fine work such as lithography, mapping, "copper-plate" and other ornamental writing.

The other types of point are sometimes used for ordinary writing pen nibs where extra smoothness is required, but with these points clear-cut definition and fineness of line may be detrimentally affected.

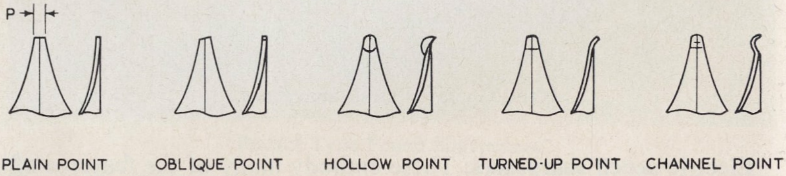


Figure 1.

(*c*) *Type of material:* Materials are chosen mainly for their corrosion resistance or elastic qualities. Unfortunately, if the utmost elasticity is required, corrosion resistance must be sacrificed and vice versa.

The metals mainly used are:—

(1) High carbon steel. When skilfully tempered, this material gives the utmost elasticity and flexibility, and is used for a large variety of writing pen nibs and for nearly all special-purpose fine pen nibs for sketching, lettering, mapping, lithography, etc. Unfortunately, it has poor corrosion resistance.

(2) Brass alloys and nickel silver. These metals are suitable only for writing pen nibs where extra-fine points and extreme flexibility are not required. They offer more corrosion resistance than high carbon steel.

(3) Stainless steel: This material is almost non-corrodible. Its physical properties are such that it is more elastic than brass alloys or nickel silver, but much less so than high carbon steel. It is used extensively for fountain pen nibs and is very suitable for ordinary writing nibs, where extreme flexibility is not required.

(*d*) *Flexibility* (not to be confused with "point-spread"): Flexibility is the property of the two "legs," which form the writing portion of the nib, to bend backwards when pressure is repeatedly applied, and always to return to their original closed position. The legs referred to are the shaded parts in Fig. 2, between AA and BB in each case. Line BB is drawn through the part of the side-slits or side-pierces furthest from the point. When there are no side-slits or side-pierces, it is drawn through the end of the pierce-hole furthest from the point.

The flexibility is governed by a combination of the following factors:—

(1) Type and physical condition of material. High carbon steel acquires its flexibility through accurately controlled tempering. The other materials acquire their flexibility by work-hardening—*i.e.*, rolling, pressing etc.

(2) Thickness of material. Obviously, the thinner the material the greater will be the flexibility and vice versa.

(3) Design of the legs. It will be realized that these legs flex along their whole length, and that the purpose of the side-slits or side-pierces (if any) is to reduce the effective width of the legs near the area where they join the main body, thus making them weaker and, therefore, more flexible.

It will be obvious, therefore, that the longer the legs compared with the narrowest width between the pierce-hole and the side-slits (or outside edge when there are no side-slits), the greater will be the flexibility and vice versa.

(4) The curvature of the pen nib (radius R in Fig. 2). The curvature of the pen nib also affects the flexibility, since this forms a "girder" section along the length of the legs. When the radius R is large, the legs will be weaker and, therefore, more flexible and vice versa.

(5) The grinding. This process has the effect of reducing the thickness of the material locally between AA and BB and, therefore, increases the flexibility proportionately to the depth and area of the grinding.

(*e*) *Point spread* (Fig. 2): This is the ability of the two halves of the point to diverge from one another when the legs are flexed.

It is governed by two factors:—

(1) The width of the pierce-hole. When this is wide, the areas where the two legs join the main body will be far apart from one another, thus making the two halves of the point diverge rapidly when pressure is applied and vice versa.

(2) The curvature of the pen nib (radius R in Fig. 2). When this radius is small, the points will obviously separate more rapidly, on application of pressure, than when it is large. It will be realized that, if the pen nib were flat, there would be no tendency for the points to open.

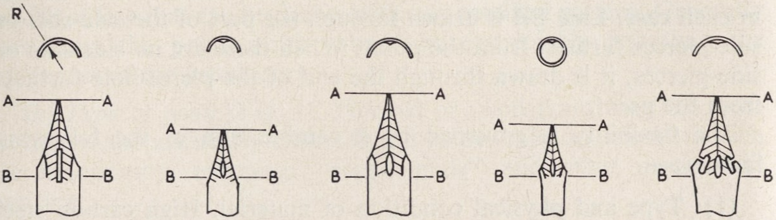


Figure 2.

Finishes Governing the Appearance of Pen Nibs

High carbon steel pen nibs can be finished bright, bronze, purple or blue, after which they are coated with clear lacquer to prevent rust. Alternatively, they may be plated with copper, tin or gold, in which case they are seldom lacquered.

Brass alloy, nickel silver and stainless steel pen nibs are usually finished in their natural metal colours (yellow, yellow-white, blue-white, respectively) and not lacquered. Brass alloy and stainless steel pen nibs are sometimes gold-plated.

Faults on Pen Nibs

Below are described some of the more usual faults which may be encountered:—

(*a*) *Scratchiness, causing spluttering*. This may result from three main causes:—

(1) The edges of the material not being sufficiently rounded at the point;

(2) The points (when viewed pointing towards the eye) must be level with one another. If they are twisted in any way or one is higher than the other, maximum smoothness in use will not be obtained;

(3) The two legs forming the point must be in contact with one another at the extreme end. If light can be seen between them, they will be inefficient in use.

(*b*) *Incorrect flexibility*. This may result from two main causes:—

(1) The side-slits may be too short or not properly sheared through the material. This adds excess strength to the legs;

(2) The material may be incorrectly tempered. This will cause the legs to be too brittle, causing premature breakage, or too soft, causing permanent distortion when pressure is applied.

It will be realized from the foregoing details that pen nibs are precision products which combine many features, each capable of variation. The quality of a product, therefore, will depend on the ability of the manufacturer to control these variables within the limits appropriate to the purpose for which each type of pen nib is produced.

Writing Inks

There are now writing instruments of many kinds, with a wide variety of writing points (nibs) and inks, capable of writing on almost any surface. In this section a "writing ink" is interpreted as one intended for use with either a fountain pen or a dip pen having a steel or other metal nib, on normal paper, card, or related surfaces.

A dip pen nib must both control and apply the ink during writing, whereas a fountain pen nib applies ink received from a reservoir via a controlling feed system. A dip pen ink must therefore be able to "hold up" on an open nib and yet flow freely during writing, whereas a fountain pen ink has to pass freely through the tighter feed system of the pen. Ideally, different inks are required for these two types of pen; in fact the distinction is normally made with only blue-black ink, since this is the colour most used by the remaining users of dip pens. Scarlet ink is used also as a contrast colour in book-keeping and is adjusted to flow reasonably well from many pens of both types—it represents a compromise.

Other colours of ink are designed first and foremost for the fountain pen. There are dip pen nibs of such design that fountain pen inks will work satisfactorily with them; likewise, a fountain pen with a fairly generous feed system will permit the flow of a dip pen ink. In this latter case colour intensity might suffer. A dip pen lays down more ink than a fountain pen; a fountain pen ink thus has a high colour content in order to compensate for this in the intensity of the writing trace.

Both the dip pen and the fountain pen are writing instruments but, by tradition, an ink designed for a dip pen is described as a "writing ink"; this distinction is preserved in the relevant British Standards (see below), though it does not disperse the existing confusion in the minds of many people.

Most inks are sold in 1 oz., 2 oz. and 4 oz. bottles. For refilling purposes 20 oz. 40 oz. and 1 gallon containers are available.

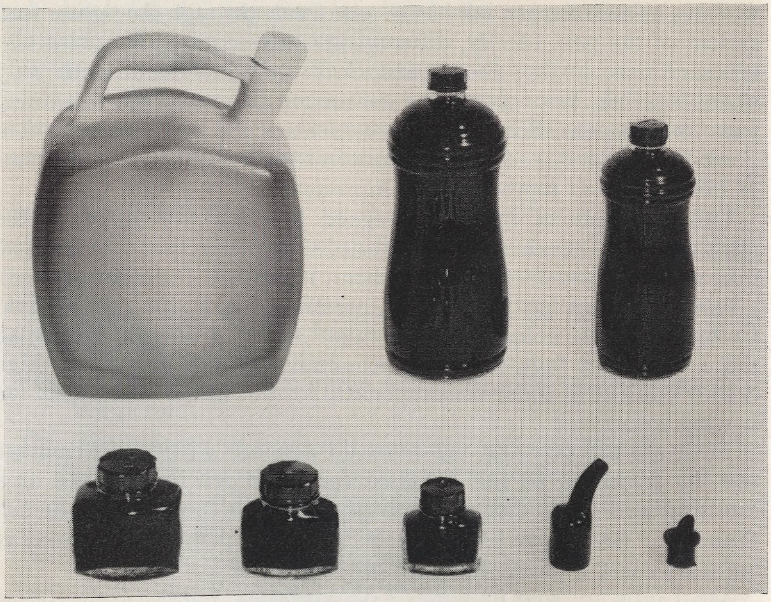
Permanency

Writing inks, using the term in the broader sense intended in this section, are of two general types: permanent and non-permanent. No ink will at all times resist the attempts of a skilful forger to remove it. The term "permanent" is relative, and signifies that the ink gives a writing trace that will remain legible for many years under normal ambient conditions. The most important inks in this category are the "blue-blacks."

Blue-black Inks

These inks give a clear blue writing trace which darkens with time though never becoming really black. In addition to the blue dye these inks contain iron sulphate and tannin-like substances, originally extracted by the ink maker from natural materials such as barks and gall nuts but now obtained as pure chemicals; these combine, together with oxygen from the air, to form a dark-coloured, water-insoluble complex. It is this which gives the writing trace its permanence. The ageing may be observed within a few hours, but it usually requires a few weeks for completion. After many years the trace may lose intensity and the complex breaks down; a brownish stain will, however, remain and the writing will still be legible.

Three types of blue-black ink are defined by British Standards.



1oz., 2oz., 4oz., 20oz., 40oz., 1 gallon Containers of Ink.

Blue-black Record Inks: Under normal conditions the writing from an ink of this type will remain legible for at least 100 years (it is sometimes called the "hundred-year ink"), and this is important to vicars, registrars, and others concerned with recording information for posterity. Record inks should not be used from a fountain pen; even if the flow is acceptable, the trace will be of reduced durability.

Blue-black Writing Inks: This defines a writing ink in the traditional sense—*i.e.*, for use with a dip pen.

Blue-black Inks for Fountain Pens: Some manufacturers offer also a permanent blue ink. This is sometimes preferred by users on account of its less dark colour; the trace is less durable than that given by blue-black fountain pen ink.

Although British Standards exist for these and other writing inks, no manufacturer yet "kite-marks" his inks nor does he claim their conformity with the Standards. As the principal manufacturers played a major role in framing the Standards, it is fairly safe to assume that their inks do conform, but, where it is important to know, it is safer to consult them.

In the trade all blue-black inks are freely described as "permanent," but the British Standards recognize only the record ink as worthy of the description. Some other inks described on their packaging as "permanent" may smudge and run in the rain or may fade on modest exposure to light. Again, when it is important to know how permanent "permanent" is, it is wise to obtain the assurance of the manufacturer.

Calligraphic Ink

This is a black ink which consists of a very fine dispersion of carbon black (like soot) and it is intended for use in calligraphy. This ink is best used from a dip pen, but it can be used from a fountain pen provided that the latter is cleaned out regularly and admixture with any other ink is avoided. Although it is not referred to in any Standard, calligraphic ink is a very permanent ink and can be eradicated only with an eraser (ageing will not affect it); it penetrates many papers so deeply that erasure ruins the paper surface in removing the writing trace.

Coloured Inks

There are two British Standards relating to coloured inks. **Red Inks for General Writing Purposes**; **Washable Inks for Fountain Pens**.

Colours are produced by adding to solutions of synthetic dyes (sometimes loosely described as "aniline dyes") substances to improve and control the flow and to preserve the ink against mould-growth. A little glycerine or similar substance is usually added to keep the pen nib moist whilst it is not actually writing.

Most coloured writing inks are by no means permanent, but they may still be very difficult to wash from fingers or clothing when spilt. A "washable" ink is one that is in fact "wash-out-able," and it is a pity that the stationery trade has now adopted a term that means the opposite of that intended by others—*viz.*, that the article will withstand washing. Only certain blue inks, and none of any other colour, will meet the requirements of the British Standard for washability.

Selling Points

The following points regarding writing inks may be found useful in advising customers.

1. Where possible, an ink should be allowed to dry naturally. Blotting reduces the colour strength and seriously affects the durability of the writing from a blue-black ink.
2. Blue-black inks may oxidize in the bottle as well as on the paper, and a bottle should therefore be kept tightly closed as long as possible. A large bottle should be used (even as a stock bottle) only when it will be used up in a relatively short time. All inks will evaporate and become unserviceable if left open or loosely capped for long periods.
3. Oxidation of a blue-black ink in the bottle will produce a sediment. Evaporation of a coloured ink may do likewise, even though no oxidation occurs. This sediment will be drawn into a pen and will eventually clog the feed and the nib.
4. It is inadvisable to mix any two inks, even two brands of the same nominal ink, and a pen must be washed out thoroughly before being filled with a different ink. Failure to observe this may lead to sedimentation and clogging of a pen; this is especially easy to encounter with fountain pens of the self-filling (capillary) type.
5. If a dip pen is not kept clean, or a fountain pen is left uncapped for excessive periods when not in use, the nib may become clogged with dried ink solids. Customers often refer to this wrongly as "corrosion"; it may usually be removed by washing with water, the nib being uncorroded.
6. Contact with metals (other than the noble metals and stainless steel) can degrade a blue-black ink and change the colour of some others. The use of metal containers or pourers can be detrimental.
7. "Quick-drying" writing inks are achieved by making the ink sink quickly into the paper, and they do not evaporate more quickly than other inks. Complaints that such inks dry on the pen nib and cause sediments and clogging are illusory; the real cause is poor maintenance of the pen and excessive standing uncapped.

Reproduction Processes

There are now very many copying and reproducing processes. Not all inks copy satisfactorily, or even at all, by all these processes. The manufacturer should be consulted in the event of inquiry.

Blotting Paper

Obviously the most important feature of blotting paper is its ability to soak up ink quickly and cleanly. Various qualities are made, which are dependent on the type of fibres used and the way in which they are treated during manufacture. All this is explained in the chapter on paper.

Many colours are available, so that the user can match with the general desk and office decor. Often it is purely a question of colour preference. However, dark colours help, to some extent, in obscuring surface soiling. The most popular colours are white, pink, buff and green.

The principal stock size is 17½ in. × 22½ in. (Demy Flat) available folded to 17½ in. × 11¼ in. (Demy Folded), the latter being suitable for the two main sizes of blotting pads. Various weights are made, but the most widely used is 38 lb. Demy ream of 480 sheets. Packing is usually in ½ reams, but this is broken down to quires (24 sheets) or even smaller quantities for the small user.

Strips of blotting paper approximately 10½ in. × 4¼ in. are sold in packs of so many strips. Alternatively, small "books" of blotting paper can be obtained. Both serve useful purposes and are convenient when large sheets are not required.

Erasers

Erasers are often called "rubbers," but today a surprisingly small proportion of them actually consists of rubber.

In spite of the many varying forms which they take, erasers fall basically into two main classes:

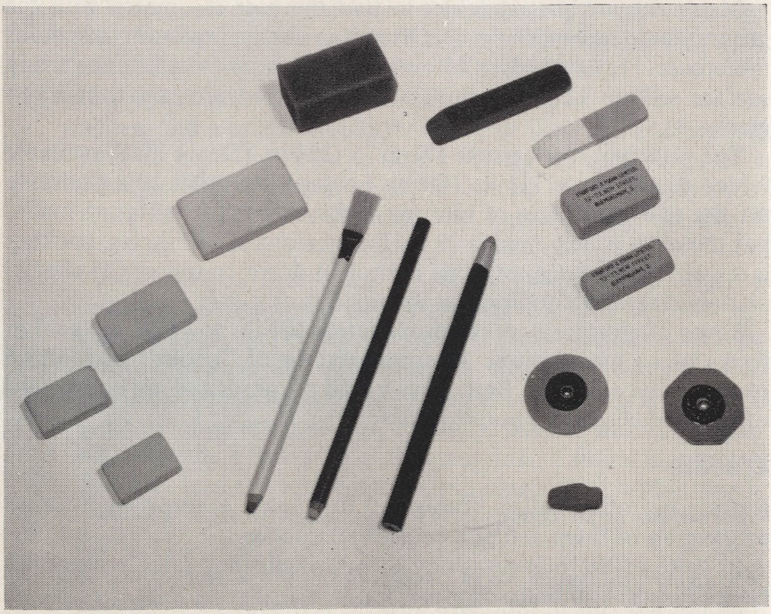
(*a*) those for the removal of pencil marks and superficial smudges, and

(*b*) those for the removal of ink marks, whether of the greasy or watery type.

Pencil Erasers: These need to be a softer, more crumbly type of eraser, so that during the rubbing action the small crumbs of rubber, together with the solid part of the rubber in contact, present ever-changing fresh surfaces, which literally pick up the graphite particles of which the pencil line is made up, leaving the paper clean and almost unaffected.

Ink erasers: With these, a more drastic process is inevitable, as all inks penetrate into the fibres of the paper to a greater or less extent. For this reason the problem of the eraser manufacturer is to compound an eraser which gently abrades away the surface of the paper and with it the stained portions which it is desired to remove.

Typewriter, ball-pen and ink erasers: These fall into the same category as the above; they all contain a certain quantity of abrasive material, such as pumice or ground glass. The pencil erasers and cleaners ideally contain no abrasive material whatsoever and function on account of their crumbliness, which is induced by compounding the raw rubber with considerable quantities of factice, which is a rather jelly-like material.



Erasers of Various Sizes and Shapes.

Drawing Office Erasers: There are, of course, some grades which are intermediate between the two extremes mentioned above, and outstanding among these is the drawing office eraser, which has to cope with deeply impressed lines of very hard pencils; for this reason it is provided with both the abrasive and the crumbly factors.

A recent introduction is the eraser made from *plastic or vinyl*. Primarily conceived for erasing on polythenes, drawing films and various types of delicate drawing and tracing paper surfaces, it has been found to be equally acceptable for use in the office, home, or school. It contains no abrasives and leaves the surface smooth and unscratched. A characteristic of this type of eraser is that the residual strips or fragments, rubbed off during erasure, do not adhere to the surface of the paper or film and can easily be removed.

Also used by draughtsmen in the *glass* eraser. This is made from fibre glass specially bonded and housed in a container from which it can be propelled or repelled. It is specially suitable for erasing Indian Ink on tracing cloth. Fragments should be brushed off the surface with a duster and not the hand.

Size and Shape: Erasers are marketed in a bewildering variety of sizes and shapes. Most makers manufacture thin circular discs for use as typewriter erasers, since this shape facilitates picking out individual letters. A longer type of eraser with bevelled ends is most popular as a drawing office eraser.

The ordinary pencil eraser is commonly rectangular in shape, and many manufacturers who market their other erasers by the gross or dozen supply pencil erasers made up in pound boxes and usually offer several alternative numbers of erasers to the pound. For example, 24s would be 24 pieces to the pound and a much larger rubber than 72s. With the coming of decimalization there may be a tendency for manufacturers in the future to use units of 100 rather than a gross, but decimal quantities very often pose boxing problems and it is no accident that our old duo-decimal system has retained its place for so long.

Pencil-shape erasers are now being sold; these are strips of rubber encased in a wood surround. Alternatively they may be paper-wrapped, with a thread which, when pulled, uncovers an appropriate amount of rubber. Usually they are the pencil or typewriter variety.

Battery powered electric erasers are obtainable, but these are mainly used in drawing offices, where often they are shared between a number of draughtsmen for convenience.

Eradicating Fluids

These eradicate inks by bleaching the dyes that they contain. One-step eradicators usually consist of dilute solutions of bleach of the usual domestic chlorine-containing type. Two-step eradicators differ in that the bleaching solution is preceded by a solution containing chemicals that "loosen" the bond between paper and ink, thus making eradication easier and less damaging to the paper. Eradicator that is kept too long in stock will become ineffective through decomposition of the bleaching solution, usually accompanied by the formation of cloudiness and sediment.

Ink eradicators are effective with most writing inks but they will not bleach many drawing inks, notably Indian ink, neither will they affect the majority of ball-pen inks; in both cases the trace is water-resistant, and this makes it difficult for the eradicator to reach and attack the colouring matter. Some ball-pen inks may be bleached if they are first carefully treated with spirit or some similar solvent, but precaution must be taken to avoid the writing being spread over a large area by the solvent or made to penetrate the paper. This may be impossible in many cases, especially when there is writing on both sides of the paper. Ball-pen inks may be regarded as ineradicable in all but a minority of cases, and in these only with an element of risk. Ball-pen-stain removers have been marketed, but these are merely solvents capable of dissolving inks and they are suitable only for application to stains on fabrics. Eradication of difficult ink-marks is sometimes possible with spot-lifting preparations but the makers' instructions must be carefully followed.

Rules

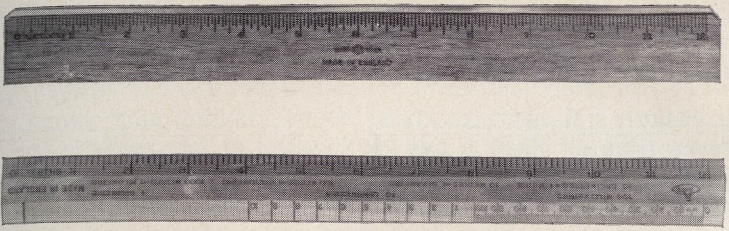
A rule or ruler is an essential part of the equipment of nearly every member of the office staff from the managing director down to the office boy. Consequently there are many qualities and styles from which to choose. At one time there was a subtle difference between a rule and a ruler. For hand-written ledgers a round ruler was most handy for ruling the lines in the bound ledgers. This had no graduations, was solely for ruling lines and was called a ruler, whereas when graduations were introduced on to a straight edge the instrument was called a rule. The round ruler is now nearly obsolete, and nearly all office rules combine the double function of being measuring instruments and being straight edges for ruling.

General Styles

An office rule is normally supplied in four lengths—12 in., 15 in., 18 in. and 24 in., and in some cases 36 in., with approximately a $\frac{1}{4}$ in. blank extension at each end. The width is usually between $1\frac{3}{16}$ in. and $1\frac{5}{16}$ in. and the thickness between $\frac{3}{16}$ in. and $\frac{5}{16}$ in. It is single-bevelled for ink ruling, and the normal markings are in inches and sixteenths, although this can vary. Some are made with a metal edge. This is a strip of metal inserted into the bevel edge and is claimed to give a smoother edge for ruling, to assist when ruling with ink, and to lessen damage to the edge. Against these advantages this type of rule is more expensive, and the process of inserting the metal does to some extent weaken the rule, as only a very thin strip of wood holds it in position and this could be liable to split. Preference for rules with or without a metal edge is about equal. Some rules are made in triangular shape giving six edges on which to mark various calibrations.

Qualities

Boxwood is the best wood and, as may be expected, it is the dearest. It is very hard and closely-grained and takes the marking and polish extremely well. It is also strong yet resilient and mellows with use. When properly seasoned it will not warp or twist.



Hardwood Rule with Metal Insert and Boxwood Rule.

Beech and **Maple** are the next qualities. These qualities are usually made with a white bevel on which is printed the calibration, and are usually imported. At one time this type was made from pearwood, but this is not usually available now.

Hardwood rules are made from **ramin** or prime quality **birch**. They are strong and the calibrations mark clearly, but they do not have the finish of the better qualities.

Perspex, either transparent or opaque, is also used. It is bevelled and more often than not has metric as well as English calibrations. The transparent type has an advantage over the wooden rule and it is also flexible, but the better qualities are expensive and rules of this type may not last as long.

Plastic Moulded rules, either transparent marked one side or opaque marked both sides, compare favourably with other types and do not warp or twist.

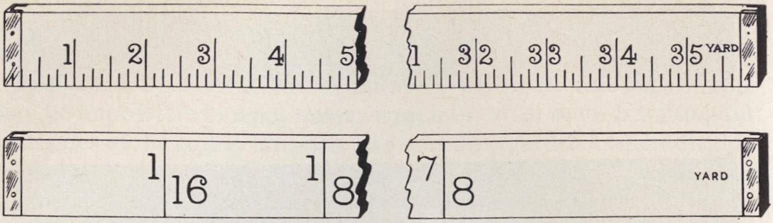
Scholastic rules are made in the same materials. They are double-bevelled with English and metric markings—*i.e.*, inches and various sub-divisions, centimetres and millimetres. Often on the reverse side are protractor markings. For this use 6 in. rules are also made. A British Standard is published on specifications for school rulers.

Special Styles

Many rules are made for specialist use and have calibrations to suit the purpose. Examples are draughtsmen's scale rules with calibrations for drawing to reduced scale, and printers rules with calibrations in ems for type measurement. The former are dealt with in the chapter covering Drawing Materials.

Steel is also used for rules, with English, Metric and other special calibrations, but generally speaking this quality of rule is sold more through tool suppliers than stationers, except for the pocket type which are dealt with in the following section.

Yardsticks: These are usually marked in inches and eighths on one side and fractions of a yard on the reverse. When used for selling lengths of material to the public they have to be brass-tipped at each end and Government-stamped as a guarantee of accuracy.



Yard Stick.

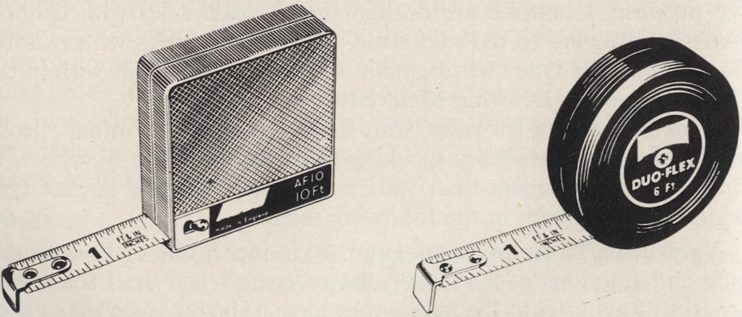
Flexible Steel Tape Rules

These are for measuring rather than drawing lines. The ordinary office style rule enables measurements to be taken up to 18 in./24 in. In excess of this size, pocket type flexible steel tape rules are normally used. They consist basically of a steel blade which is concaved for rigidity and sufficiently flexible to coil up into the case when not in use. The latter can be circular, or D-shaped, incorporating a 2 in. wide base to enable the user to take accurate "inside" measurements.

The blades are made from tempered flexible spring steel, with coated metallic finish, or a white stove enamelled finish. Markings are usually in black, although sometimes on the white finish the feet and/or decimetre markings are shown in red. The usual lengths of blade are 6 ft., 6 ft./2 m., 10 ft., 10 ft./3 m., 12 ft., available with the following calibrations:—inches and feet, inches and centimetres, centimetres and metres.

Cases are made normally from metal or plastic. Some models are of the pull-push type, whereas others incorporate an automatic return mechanism, usually with some form of break to arrest the blade in any desired position. With some models it is possible to replace blades in case of breakage.

The wide range of rules available caters for industrial, commercial and domestic use. Additionally, they are admirably suited for advertising gift purposes.



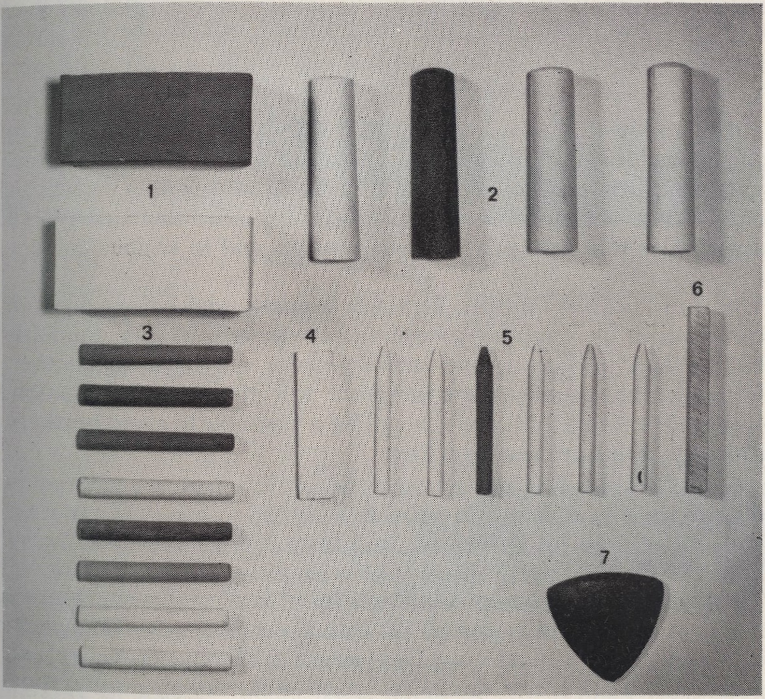
Flexible Steel Tape Rules.

Chalks

Blackboard Chalk

The majority of chalk sold is used for educational purposes and the best known is the ordinary school blackboard chalk. It is available in several qualities and various colours and is made by most manufacturers to a British Standards specification. Enamelled chalk has a special coating to protect the hands from chalk dust, and a more expensive type is made as an "anti-dust" chalk, as the presence of dust is a constant source of irritation and discomfort to both teachers and pupils. It is also important that such chalks should be non-toxic.

The basic raw materials are: calcium sulphate, precipitated chalk, clays and other binders and pigment colouring.



Various Types of Chalk.

1. Playground Chalk.
2. Railway and Textile Chalk.
3. Blackboard Chalks.
4. Lettering Chalk.
5. Pastel Chalks.
6. French Chalk Stick.
7. Tailors' Chalk.

Other types of chalk are as follows:—

Lettering Chalk: Specially shaped in rectangular pieces for demonstrating lettering or music notation.

Pastel Chalk: These are small pointed chalks, especially useful for fine detailed work on board, slate or paper.

Playground Chalk: Used for marking out playgrounds, gymnasiums, etc. and supplied in large blocks.

Railway Chalk: Made in extra large size for the marking of railway goods trucks.

Textile Chalk: Also made in extra large size for marking textiles.

Two other types of mineral referred to as chalk and which have specialist applications are:—

French Chalk: This is mined in France, Norway and other countries. In solid form it is also known as a crayon and sometimes called Soapstone crayon, Talc pieces, or Genuine Metalworkers crayon. Split from lump French Chalk it is considerably harder than blackboard chalk and is suitable for marking cutting lines or welding lines by steel fabricators and other metal workers. An even harder variety is Green French Chalk.

Tailors Chalk: This is actually a Pipe Clay and sometimes called by this name. It is used by tailors, certain industries, such as furniture manufacturers, and housewives, for marking cutting lines on fabrics, from which it can be removed by brushing. The standard type is supplied as thin triangular or square pieces and in various colours.

The size, hardness, weight, breaking strength, and colour mark of chalk varies considerably according to type and quality. Similarly boxing and packing quantities vary from one type to another. Reference to manufacturers literature will give such information. It should be noted that careful handling is desirable to avoid breakage as many chalks are easily broken.

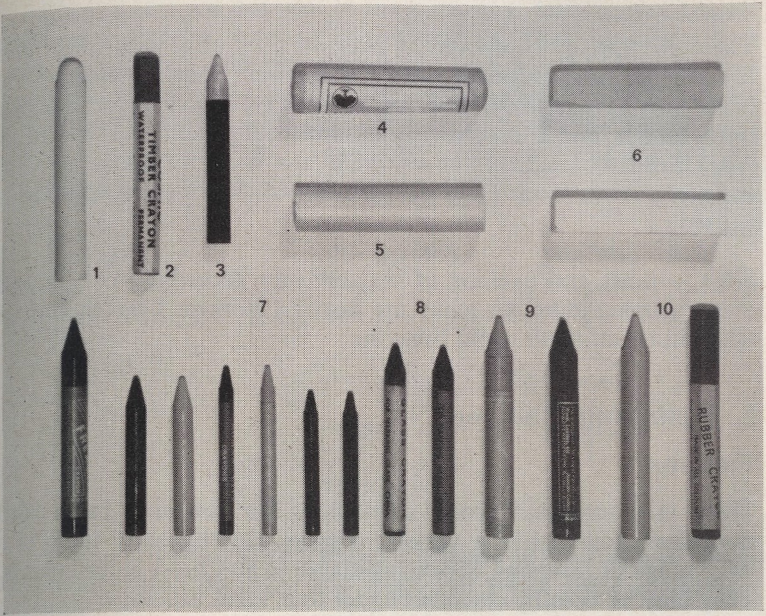
Crayons

Crayon Pencils

The term "crayon" covers a multiplicity of implements which make marks in colour, but in general the crayon pencil consists of pigment in a very finely ground condition, mixed with binders, waxes and gums. There are many variations which give varying results, from the "greasy" type to the "chalky" type. Those with a high fat content are suitable for marking on glass or shiny surfaces, while the harder type is suitable for school and art work and is available in different degrees of hardness or thickness and for special purposes.

Wax Crayons

There is a great variety of wax crayons which have no cedar wood casing, but are generally paper wrapped. The basic materials used



Various Types of Crayons.

1. Paint Crayon.
2. Timber Crayon.
3. Inspection Crayon.
4. Timber Crayon.
5. Railway Crayon.
6. Road Crayons.
7. School Crayons.
8. Glass Crayons.
9. Waterproof Crayons.
10. Rubber Crayons.

are paraffin wax and other harder types of wax and pigment colours. These are moulded or extruded in many diameters and lengths, and the colour release varies a great deal. As is often the case, the cheaper the product the less good the colour mark. While cheaper varieties are used extensively in schools, the better qualities are also sold to industry.

Some of the uses for which crayons are specially made include the marking of timber, rubber, glass, stone, metal, leather, yarns and fabrics. Additionally a waterproofing quality is necessary for some purposes such as the marking of parcels, as well as some materials already mentioned. Inspection crayons are used for marking nylon, silk and rayon fabrics, and wax tailors crayons are used for marking on fabrics, such as cotton and wool which will stand a hot iron, since the mark is removed by heat. Foundries need a crayon whose "mark" will stand up to very high temperatures and a special range is made for this purpose.

Paint Crayons

These are literally composed of paint in stick or crayon form, and combine the advantages of paint and crayons. They are used widely in the ferrous and non-ferrous metal industry, as well as for marking tyres, timber, and a large variety of industrial products. The various types available include those which are used for marking cold surfaces, hot surfaces, and cold surfaces which are going to be heat treated.

Sizes, colours and packing of crayons vary according to type and manufacturer, although many are boxed 1 dozens. Care should be taken in handling to avoid breaking.

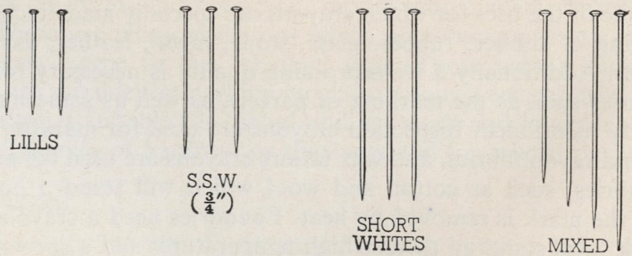
2. Fastening Devices

Fasteners

There is a universal need for methods for fastening paper and documents together in a variety of ways. Consequently there is a wide range of fastening devices available to suit most requirements. They may be broadly classified under four main headings.

Pins

While there are innumerable types and uses of pins over a wide variety of trades, the principal type used in the stationery trade is the **plated pin** for the fastening of several sheets of paper. Plated pins are made from mild steel, and the most popular lengths are ½ in. (known as "lills"), ¾ in., and 1 in. (known as "short whites"). The packing is in ¼ and 1 lb. boxes of a size or mixed. They are also made up in quantity to sell at a specific price. It should be noted that, although a ¼ lb. box of ½ in. lills is more expensive than a ¼ lb. box of 1 in. pins, in point of fact the actual price per pin is very often cheaper. For the three sizes mentioned the approximate quantities per pound are ½ in.—12,300; ¾ in.—8,200; 1 in.—3,780.


LILLS

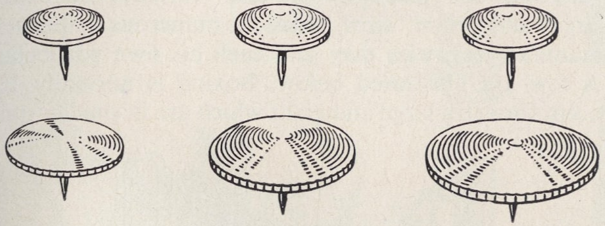
S.S.W. (¾″)

SHORT WHITES

MIXED

Plated Pins.

Although they are not used in the same way, **drawing pins** may be mentioned here for the sake of convenience. They are made from steel, brassed steel, and brass, the usual sizes being $\frac{3}{8}$ in., $\frac{7}{16}$ in. and $\frac{1}{2}$ in. diameter of head. For draughtsmen's use larger sizes are made, these being $\frac{3}{8}$ in., $\frac{3}{4}$ in. and $\frac{7}{8}$ in. diameter of head. The smaller sizes are made also with plastic-capped heads in a variety of colours. All are available in packings of various quantities.



Drawing Pins.

For similar convenience, reference is made to pins used to designate information on maps and charts, of which there are several varieties.

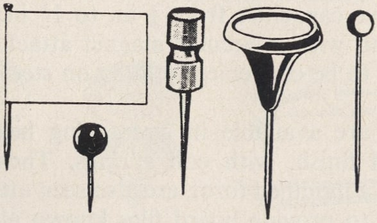
Map tacks are approximately $\frac{1}{2}$ in. long with a small bead-shaped plastic head.

Push pins are slightly larger, with a cylindrical head or flat top. The cylindrical type has a groove round the circumference of the head, to enable thread to be wound from one pin to another on the map.

Indicator pins are approximately $\frac{3}{4}$ in. long with flat heads some of which have an inset of paper or card to enable information to be written on the head.

Toilet pins are approximately $1\frac{1}{4}$ in. long with a small bead shaped head.

Flag pins can be a plated pin or toilet pin on to which a paper flag is fixed.

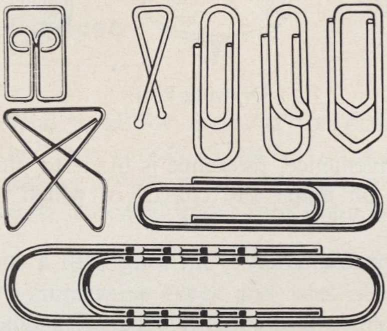


Map Marking Pins.

All these pins are available in several sizes and a great many colours. The packing may be in hundreds, grosses, or quantities to a specific price.

Paper Clips

These are for holding together small quantities of papers. They are made from steel or brass wire, the usual sizes being "small" and "large," in "plain," "lipped" and "no tear" styles. Although in smaller demand, the "plain" or "no tear" varieties are made also in "extra large" and "giant" sizes. There are numerous shapes according to the manufacturer, who may give each his own particular brand name. A few are illustrated below. Boxing is normally 100s and 1000s except for extra large and giant which are in smaller quantities.



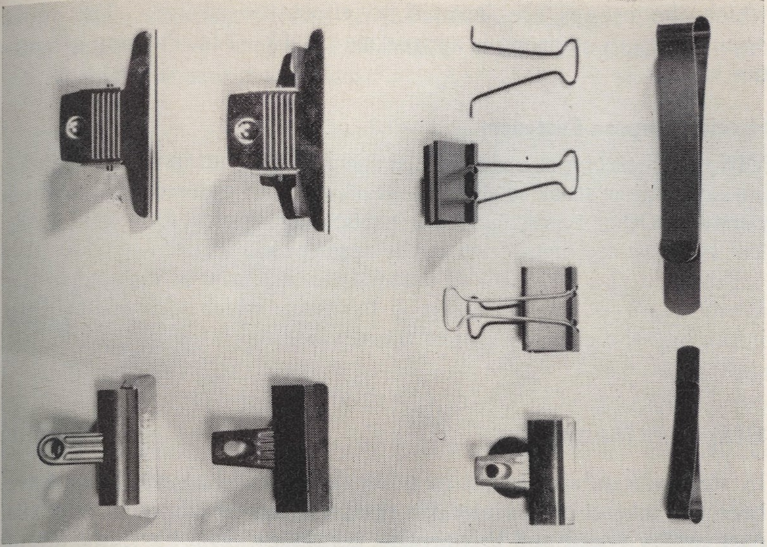
Paper Clips.

Letter Clips

Clips in this group are of the "spring-grip" type, suitable for securing greater thickness of paper, and are particularly useful for hanging on to a hook or fixture.

Types vary, but the use of tempered steel springs is common. These are usually round, although recently a triangular shaped spring has been introduced; a spring of similar shape is employed on the "foldback" type of clip which has wire handles that can be positioned for hanging or folded back to lie flat against papers when these are being carried. In all types the width of jaws and size of spring vary to give capacities from ¼ in. to 1½ in. Certain patterns of clip can be had with a circular magnet attached which enables papers or notices to be conveniently hung on steel cabinets, girders, etc.

Stronger clips are available in sizes using heavier gauge jaws, usually in plated finish, with coil springs. These have generous capacities and, in a modified form, are also seen attached to metal or hardboard backs to provide board files known also as clipboards. Packing quantities vary according to size.



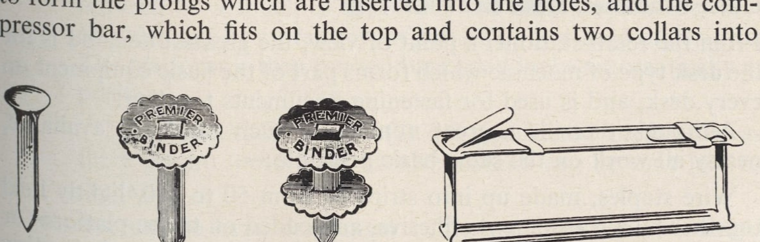
Letter Clips.

Prong Clips

With this group the papers are pre-punched with one or more holes. The **paper fastener** has a small round head with a pair of prongs, which after insertion into papers, are bent outwards to effect compression. They are made from brass or white metal.

For more secure fastening **paper binders** are used. Made from similar materials, they have larger heads and are used in the same way. They are available also with washers to place over the prongs on the reverse side of the sheets before bending them outwards. Both types are available with length of prong varying from $\frac{1}{4}$ to 3 in. The larger sizes can be made up to 6 in.

For fastening sheets with two holes—usually 7 or 8 cm. centres—a **twin-prong** fastener, made from white metal in two parts, is used. The two parts comprise the base, the ends of which are bent upwards to form the prongs which are inserted into the holes, and the compressor bar, which fits on the top and contains two collars into



Paper Fasteners, Binders and Twin Prong Fasteners.

which the prongs are inserted to effect the security. The most popular length of prong is approximately 1½—2 in. Packing quantities vary.

Special Purpose Fasteners

Various special types are made for specific uses, but in the main these are not kept as stock lines by the stationer, but ordered as and when required. Other types, made for particular use with filing and loose leaf systems, are mentioned in the appropriate section.

Finally it should be stated that plastics are now being used in the manufacture of many types of fastener, which, in addition to improving the effectiveness of the device, make the range and use still wider.

Stapling Machines

In step with advancement in other fields, stapling machines have been the subject of considerable research and development over the past twenty years, and this process continues. So it has come about that the somewhat clumsy appliances, that were principally used for holding a few sheets of paper together, are now available in many forms, each manufactured to a very high degree of engineering precision, and designed for specific needs of commerce generally. The sale of stapling machines and staples has developed into a multi-million pound industry.

Pocket Stapling Machines

There are many pocket, or miniature, stapling machines which are sold through the retailer. These are certainly not toys, are particularly useful for a variety of purposes around the home, and can be carried about in pocket, brief-case or hand-bag. They should not, however, be recommended for general commercial use because of their natural limitations of staple length, throat capacity, etc. Many thousands are sold suitably overprinted for gift advertising purposes.

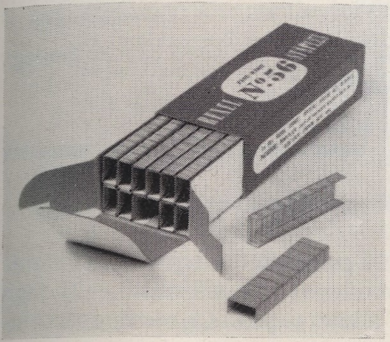
Office Machines: Desk and Plier Type

From the retail stationer's point of view, the greatest demand is for the **desk** type of machine which forms part of the basic equipment on every desk, and is used for fastening documents together.

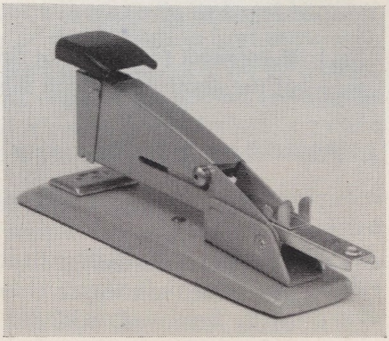
Although there is a great number of such machines available, nearly all work on the same basic principle:—

Wire staples, made up into strips of from 50 to 210, lightly held together by a transparent adhesive, are loaded on to the platform or guideway provided. There are three basic types of loading methods:—

(1) **Rear Loading:** Access to the loading platform is from the back of the machine, and usually involves first removing the push bar and mechanism.

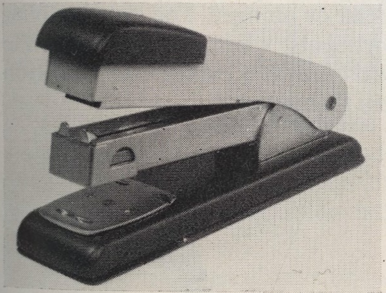


Staples.

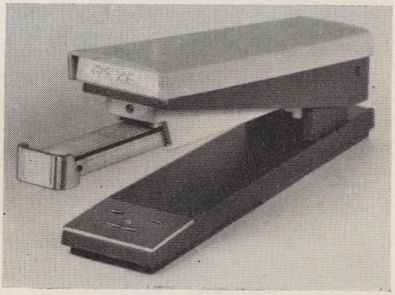


Rear Loading Stapler.

(2) **Top Loading:** Loading of this type of machine is effected on the open-book principle, the top of the body hinging back to allow access.



Top Loading Stapler.



Front Loading Stapler.

(3) **Front Loading:** As the term implies, the loading platform is released by a touch of a button, and then projects forward, allowing one or more strips of staples to be placed in position. The platform is then pushed back, and locks automatically in position.

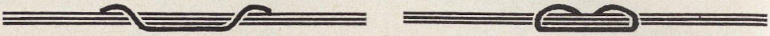
N.B.—Methods (1) and (2) are considered preferable, as there are no loose parts involved which can become lost or damaged.

Pressure on the head or plunger of the machine causes a single staple to be driven through the material to be fastened together and into contact with the stapling anvil accurately aligned underneath.

This causes the legs to bend horizontally, producing a firm, flat fastening.

The anvil has two grooves in it to guide the staple legs under pressure into a pre-determined shape. Most modern machines are now designed to give two alternatives:—

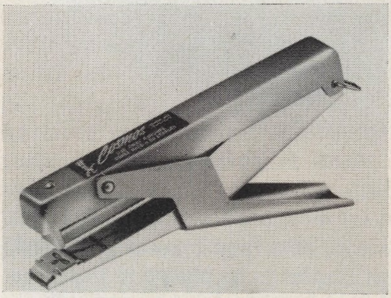
(1) **Permanent fastening:** In this position the anvil causes the legs of the staples to clinch inwards.



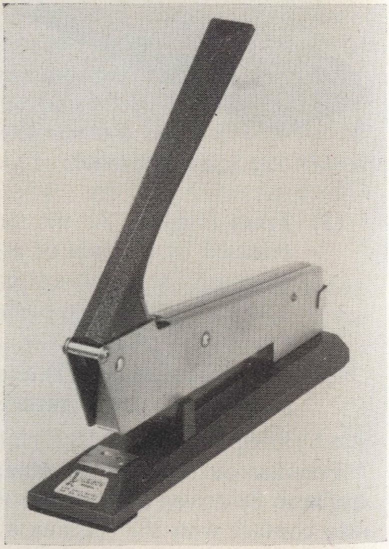
Temporary and Permanent Fastening.

(2) **Temporary fastening:** In this position the legs of the staple are forced outwards to produce a "pin" which, although easily removed, will not allow papers to come apart involuntarily.

Nowadays, quite a number of users prefer the **hand plier** type of machine for office use. The smaller compact varieties fit flat in desk trays, use small gauge staples, and produce a neat unobtrusive fastening. Stapling pliers work on much the same principle as desk machines, but the staples are driven by tightening the hand-grip rather than by depression of the head or plunger. The stapling plier is particularly useful in filing departments, where the "nose" of the machine can be inserted downwards into the cabinet for collation of papers within the vertical folders themselves.



Above: Hand Plier Stapler.



Right: Heavy Duty Stapler.

Specialized Office Machines

The machines so far referred to, effective as they are, have their limitations:—

(*a*) **Capacity:** The number of papers that can be fastened together is determined by the length of the staple leg, and most desk machines are designed to take staples with a ¼ in. or 3/16 in. leg. Bearing in mind that the ends of the staples have to be bent inwards or outwards to effect secure fastening, it will be seen that capacity must be limited within definite confines.

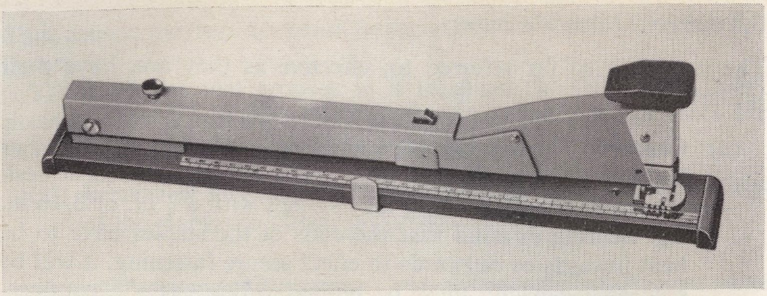
(*b*) **Reach:** Desk machines and stapling pliers have a defined depth of throat. By this it is meant that papers can be inserted only just as far as the point at which the body is hinged, and it is therefore impossible to staple at a point beyond this limit—*e.g.*, along a centre fold to form a book or pamphlet.

Under (*a*) it is possible to obtain greater capacity by "stabbing." Most types of desk machine can be used to drive a staple straight into a larger thickness of papers. By driving a staple into the papers from both front and back it is possible to fasten a greater thickness together by positioning the staples in overlapping positions. However, as the staples are not clinched in any way, this method does not provide real security or permanence. Special machines are therefore available to meet these applications:—

(1) "**Heavy Duty**" **Machines:** These are designed to take staples having legs up to ¾ in. in length, operated either by the direct plunger method or on the lever principle, the latter being more effective and less fatiguing from the operator's point of view.

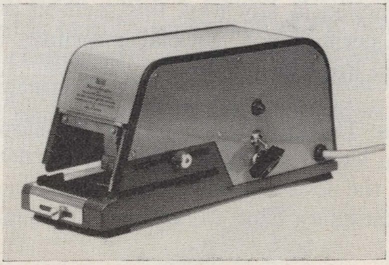
Care must always be taken to select staples of the correct length for the particular job in hand. The use of too short a staple-leg will not permit proper clinching; too long a leg will produce an equally imperfect effect, and, in extreme cases, will cause the machine to jam. Most "heavy-duty" machines are designed for use with several leg sizes from 5/16 in. to ¾ in.

(2) "**Long-Arm**" **Machines:** As the name implies, these machines have a "throat" considerably greater than standard desk machines, often 12 in. or more. To ensure that the stapling head always registers with the anvil, such machines have to have special built-in features, including added strength at the hinge and a calibrated throat scale, in inches and centimetres; they take staples of various leg lengths as referred to above.



Long Arm Stapler.

(3) **Electrically Operated Machines:** Where a very great number of stapling or pinning operations is required, (*e.g.*, in mail rooms for collation of bulletins etc.), machines are available which operate automatically by electricity. As the papers are inserted into the machine, they trip the mechanism. Such machines provide very fast and sustained accurate service with complete safety, the position of the fastening being pre-determined by adjustment of lateral and horizontal platforms.

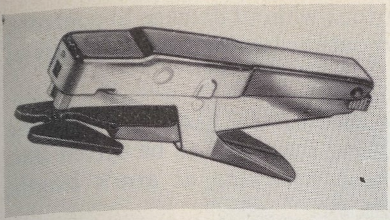


Electrically Operated Stapler.

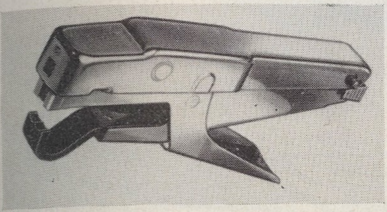
Specialized Industrial Machines

Naturally, in terms of quantity, the greatest number of machines sold through the retail stationer will fall under categories already covered, but there is an ever-increasing demand for specialized machines used for packaging, display, shop-fitting and light industrial use, and still hand-operated. Generally speaking, pneumatic and other mechanically operated machines are not handled by the retailer.

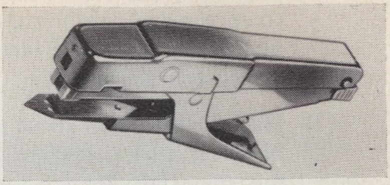
(1) **Stapling pliers:** These have already been dealt with in part, but there are available types of pliers designed to cater for much heavier work, such as the closure of coal bags, sacks, the tagging of carpets and fabrics, and the making up of swatch-books, etc.



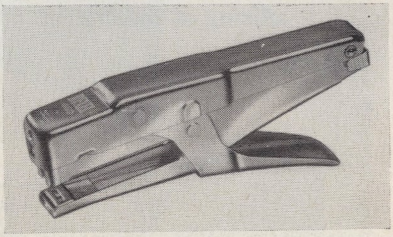
Bag Stapler.



Stapler for Fastening Material around rods.



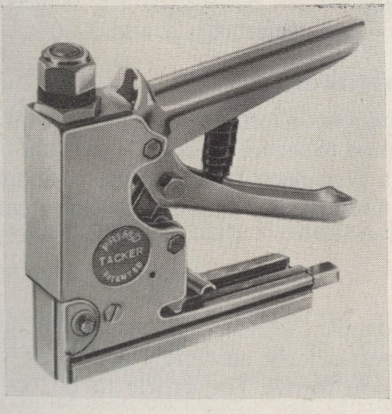
Carton Stapler.



Heavy Duty Plier Stapler.

Such machines are engineered to drive staples without difficulty or fatigue through, for example, hardboard, light metal and considerable thicknesses of material. Modified, they are also capable of sealing cartons, closing polythene bags, and fastening fabrics around dowel rods.

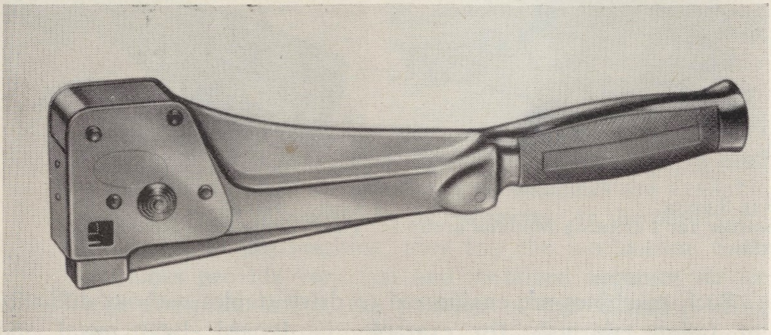
(2) **Trigger-tackers:** These machines have a built-in mechanism allowing them to drive staples directly into wood, hardboard or similar materials by downward or upward pressure on a handle mounted on top of the appliance. There is no recoil. Such machines are widely used for light construction, shop-fitting and window-dressing, as well as for labelling shipping cases etc. A modification provides for the staple legs to splay outwards, thus allowing labels to be securely fastened even



Trigger Tacker.

to corrugated cardboard cartons without damage to contents, as the staple legs are turned outwards within the thickness of the carton wall itself.

(3) **Hammer tackers:** These are used exactly like a hammer, the blow on a solid surface causing the staple to be driven into the material. Useful for speedy tacking at arm's length, affixing of roofing felt, labels, etc.



Hammer Tacker.

Staples

Too much emphasis cannot be laid on the necessity of ensuring that the correct gauge and size of staple are used with a particular machine. It is a fact that one strip of the wrong type put through a machine will almost certainly cause irreparable damage. Both machines and staples are made to exacting degrees of tolerance and precision.

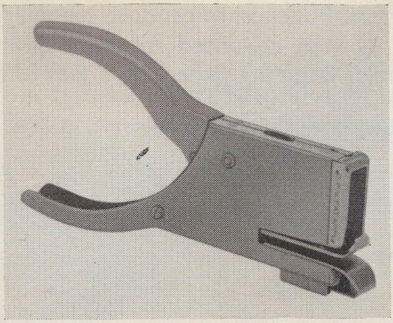
Many machines of the desk variety are now sold complete with an initial supply of staples. In other cases, it is important to ensure that the correct type of machine and staple is sold in the first instance to meet the required application. All staples are packed in 1,000's or 5,000's, although some are available in 2 and 3000's.

Clipless Paper Fasteners

The clipless paper fastener cuts a tongue through two or three sheets of paper which it is required to secure together, and tucks this tongue through a slit to form a fastening. This machine is designed to fix together only three or four sheets, and the fastening can only be regarded as temporary.

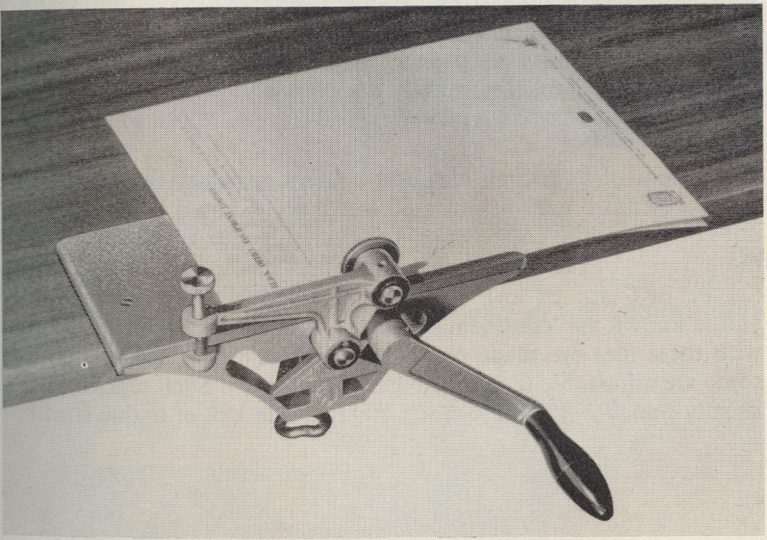
Crimpers

A crimper consists of two milled wheels, operated against one another under pressure. It is particularly suitable for sealing envelopes, small packets or quotation forms. The article to be "crimped" is



Clipless Fastener.

fed between the wheels by means of the handle, and a serration is produced which secures the top and bottom surfaces together. A strong union is made which, within the limits of its capabilities, serves a useful purpose.

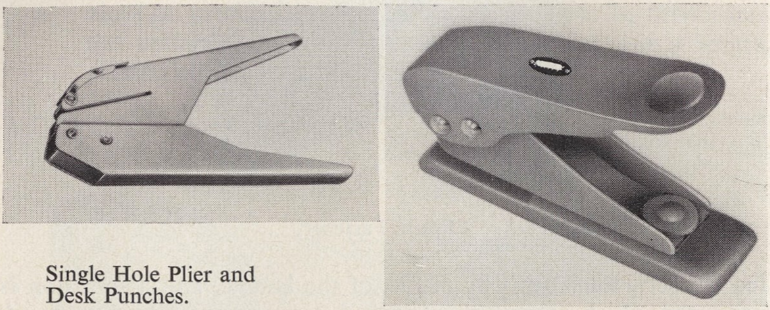


Crimper.

3. Loose Leaf and Filing Accessories

Punches and Perforators

Both names, "punch" and "perforator," are commonly used, but "punch" is preferable, as it is shorter and avoids confusion with pin-hole or line perforators, which simply make perforations, of which the commonest example is that of stamp-edging. This type is dealt with elsewhere. Punches, to produce regular, clean holes, were needed as soon as man advanced from the primitive method of "filing" by means of impaling papers on a nail or a spike file.



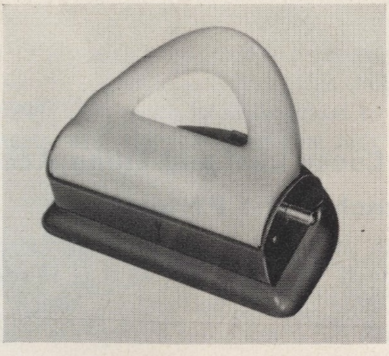
Single Hole Plier and Desk Punches.

Single Hole Punches

In the main, these are made to work on the hand-plier principle, with diameter of hole sizes varying from $\frac{3}{16}$ in. to $\frac{5}{16}$ in. They are similar to ticket nippers (punches), and are suitable only for punching a small quantity of papers, though desk models made from castings are available for slightly heavier duty.

Two-hole Punches

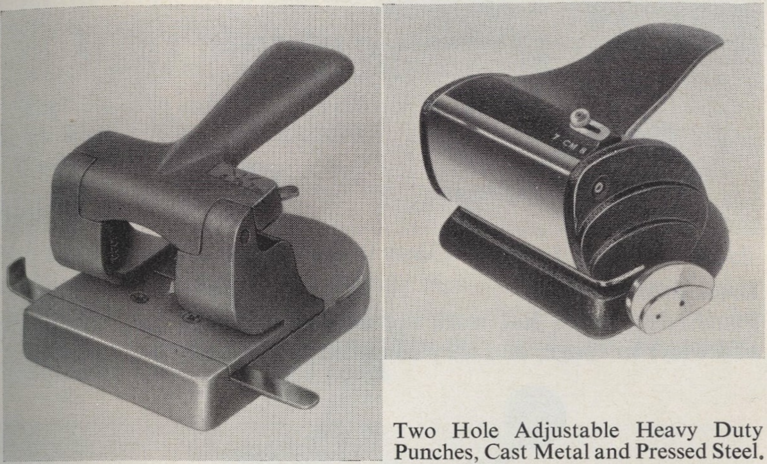
The advent of lever-arch files and binders, in which papers are put on two or more upright posts or wires, necessitated holes being cut out corresponding to the diameter and gauge, or distance apart, of the uprights of the files. In lever-arch files this gauge is either 7 cm. ($2\frac{3}{4}$ in.) or 8 cm. ($3\frac{1}{8}$ in.). The latter (the wider) is the more popular and is known as "continental" gauge. The cheaper punches for use with these files are made out of metal pressings or stampings, and some are adjustable to both gauges, 7 and 8 cm. Such machines will usually punch only 3 or 4 sheets of paper and risk of undue strain or



Two Hole Adjustable Punch.

overloading is minimized by limiting the capacity of the throat into which papers are fed.

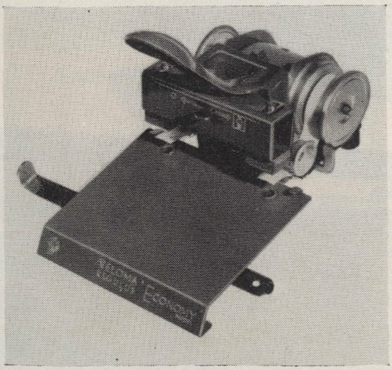
Heavier and more powerful machines for this and loose-leaf work are made from castings, sometimes mounted on wooden bases, but cast alloy or steel pressed models are now replacing the old-type castings.



Two Hole Adjustable Heavy Duty Punches, Cast Metal and Pressed Steel.

Reinforcing Punches

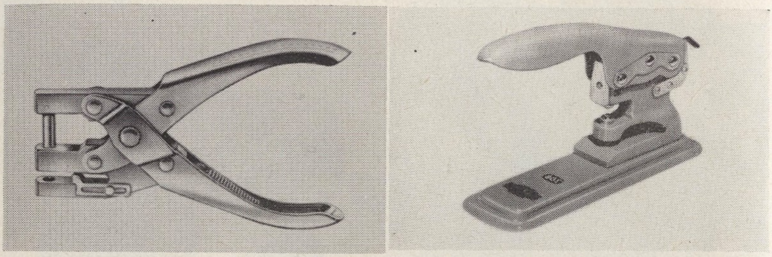
Experience teaches that with lever-arch and similar files there is a tendency for thin papers to tear at the punch holes. To overcome this, punches are made, in the two standard gauges, which reinforce the area round the holes as they are punched, by automatically applying self adhesive paper or plastic.



Reinforcing Punch.

Eyeletters

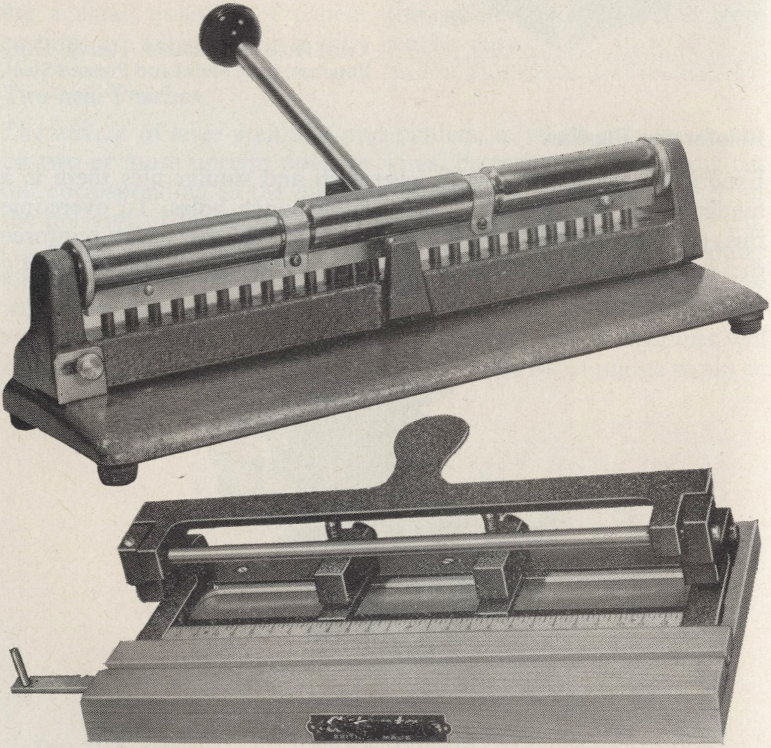
These operate on the hand-plier principle, or fulcrum and lever action for desk models and punch a hole and eyelet in one operation. They are normally satisfactory for up to 25 sheets of paper, and several sizes are available. They provide an easy method of additionally reinforcing the holes where usage demands.



Plier and Desk Type Eyeletters.

Loose Leaf Punches

Punches for loose leaf work are necessarily much more elaborate and wider in range, and they comprise (1) ordinary hand-operated,



Multi-Hole and Adjustable Loose Leaf Punches.

(2) treadle-operated and (3) power-driven machines. In this chapter, the hand-operated type is principally under consideration. They are adapted for punching round holes of varying numbers and diameters and also shapes (slots, keyholes, etc.), or both round holes and shapes together at one operation. There are two main types of machine:

(*a*) those that make holes not variable as to position; and

(*b*) punches that carry "heads," each punching a single hole or shape, which can be adjusted to any position laterally.

The distance into the paper from its edge to the centre of the holes is governed by "back-to-front" gauges set on some or all of the individual heads.

Drills

There are also hand-operated or power-operated machines which *drill* holes, as distinct from punching them. The advantage of such machines is that capacity is greatly increased, so that holes can be drilled in a bound book or magazine that would not be accommodated by a hand-operated punch.

Single and Double Drills.

Ordering Requirements

When ordering punches for special purposes the following details must be given:—

(1) Number and diameter of round holes;

(2) Distance from edge of paper to centre of holes—*i.e.*, margin;

(3) Distance apart, centre to centre, of each pair of holes;

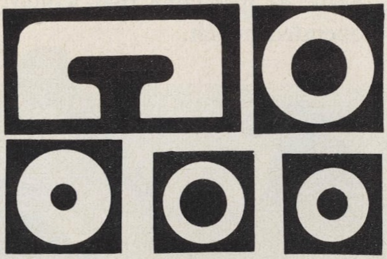
(4) Accurate patterns of "shapes," if these are required;

(5) Quantity and thickness of papers required to be punched at one operation.

Like all other machinery, punches require considerate handling and occasional judicious oiling. Where a punch is provided with a "pit" to collect the paper cuttings, this should be emptied at frequent intervals. Failure to do this causes jamming.

Reinforcement Washers

The leaves in a ring binder that is subject to continual use often tear at the punch holes. This happens particularly with two-ring mechanisms. To overcome this weakness or to repair torn sheets, circular reinforcements can be used. They are made from cloth or vinyl plastic with gummed or self-adhesive backs. A variety of sizes is available, although $\frac{7}{32}$ in. diameter hole is the most popular. Where they are required for sectional post loose leaf binders, larger diameter holes will be required, and, for use on thong binder sheets, a reinforcement in the shape of the thong punching is made. Packing is usually in 100s, 200s, 250s and 1000s.

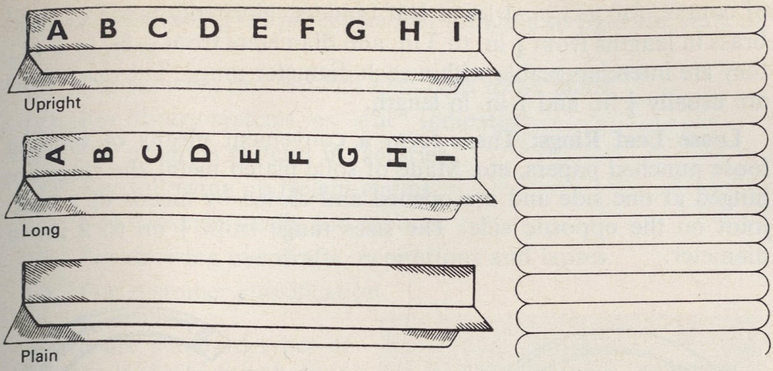


Examples of Reinforcements.

Index Strip and Tabs

A simple and economical way of making special index tabs for use with loose leaf books or files is by the use of transparent index strips. These are made from acetate in several colours, with a gummed cloth skirt. The length is normally 6 in. and the width either $\frac{1}{2}$ in., suitable for three typewritten lines, or $\frac{3}{8}$ in., suitable for two typewritten lines. Insert paper is supplied in perforated strips suitable for typing on. Fixing of the required length is effected by moistening the gummed skirt, placing in position on the sheet and rubbing down. Similar strips are made wholly from cloth, but the information is written directly on the tab, and they do not wear so well as the acetate type.

Made on the same principle as index strip, are plain, alphabetical or numerical tabs. Material may be of paper, cloth, canvas or acetate, and the fixing is by the same method.



Index Tabs and Titling Strip.

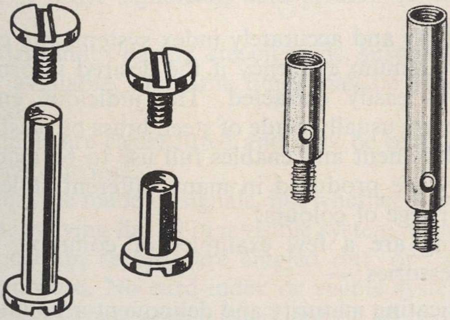
Titling Slips

These are used with manilla files and are simply strips of gummed paper perforated at intervals. The width is approximately 4 in., and perforations are at intervals of from $\frac{1}{4}$ in. to $\frac{1}{2}$ in. Their use enables reference to the contents of the file to be typed on the slip, which is then separated at the perforation and stuck on to the titling edge of the file or folder.

Loose Leaf Fasteners

There are numerous types of fasteners suitable for loose leaf books or file covers. Some have been mentioned elsewhere in this chapter, because they are suitable for other uses. Where they are mentioned here, only a cross-reference will be indicated.

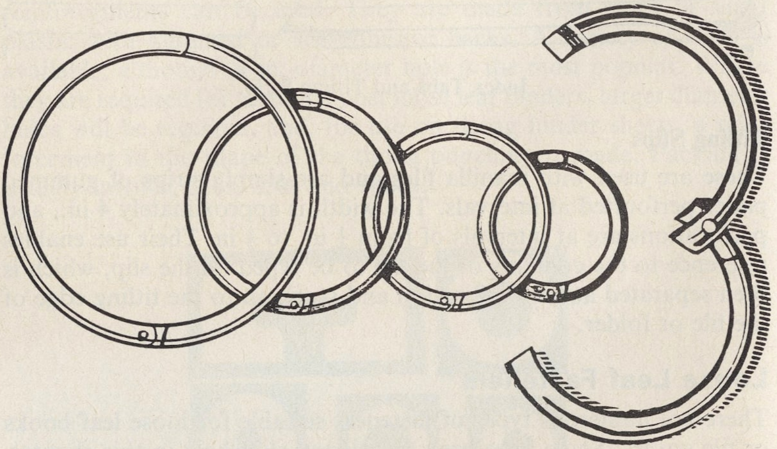
Interscrews: These can be used for a fixed capacity, but the advantage of their use is that they are so made that extensions can easily be fitted to cope with increased capacity. They are very useful for catalogue covers or for binding sheets in loose board covers and,



Interscrews.

of course, for sectional loose leaf binders. Normally made of solid brass in lengths from $\frac{1}{4}$ in. to 3 in. and diameters from $\frac{7}{32}$ in. to $\frac{3}{8}$ in., they are interchangeable within each diameter range. The extensions are usually $\frac{1}{2}$ in. and 1 in. in length.

Loose Leaf Rings: These form a convenient means of binding loose punched papers, etc. Made of solid plated metal, the rings are hinged at one side and are opened and closed by means of a snap joint on the opposite side. The sizes range from $\frac{1}{2}$ in. to 2 in. in diameter.



Loose Leaf Rings.

Prong Fasteners: These are referred to in the general section on Fasteners.

Treasury Tags: These are referred to in the section on Legal Accessories.

Signals

However carefully and accurately index systems are compiled, they fall short of maximum efficiency if the desired information cannot be quickly and easily extracted. The judicious employment of signals—which are usually made of steel, brass or plastic—meets this important requirement and enables full use to be made of the data collected. They are produced in many different styles and shapes, and in a wide range of colours.

The following are a few examples of common uses of these invaluable accessories:—

(*a*) For indicating maturity and delinquent accounts in collection and instalment systems.

(*b*) For following up purchases and bringing to light the state of stocks.

(*c*) For showing professional men calls to be made.

(*d*) For library systems, as "due" indicators.

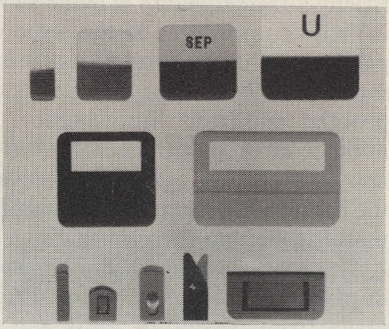
(*e*) For progress systems in factories.

(*f*) For following up freight claims.

(*g*) For salesmen's calls and reports.

(*h*) For showing overdrafts, expirations and lapses.

(*i*) For customer classification.



Signals.

There are standard types of signal, each of which includes a range of sizes, which the manufacturers pack in regular quantities of styles and colour per carton. Frequently colour indication alone is sufficient; where additional detail is needed some types may be lettered or numbered.

Projecting types are used on upright card systems, card-wheels, and loose ledger cards and are suitable for lettering or numbering additionally.

Window types incorporate a removable label, with a protecting plastic shield. They are generally larger than the plain projecting type, and enable names or codings on cards, files or pockets to be identified.

Non-projecting types, used for visible systems and loose leaf binders, clip round the edge of a thin sheet and can be positioned to mark dates or other significant data printed on the edge of the sheet.

Signals for strip-index panels, stencil cards, suspension and lateral filing, etc. are available, and othe types may be obtained to meet specialized needs.

All these signals are easily fitted and may be removed when they have served their purpose.

Many uses may be made of signals, but whether protruding as in a vertical system, or lying flat as in a visible system, signals indicate at a glance that certain records are singled out, or "signalled," for some special purpose. No card-index or visible system is complete without its signals. Their usefulness is out of all proportion to the minute space occupied by their stock.

4. Rubber and Metal Stamps

Rubber Stamps

Rubber stamps provide an easy and speedy method of transferring on to paper a particular form of words in common use, or numerology such as a date, or a facsimile signature, and as such they are of particular value to business houses.

Manufacture

Briefly a rubber stamp is made as follows. The wording of the stamp is first set up in type in the same way that a printer sets up type for printing. Where a special design is required, this is produced in the form of a block. Type and blocks are then locked up in a type forme, proofed and read for accuracy. As rubber stamps are small, a number of them are assembled in the same forme. After the proof has been checked, and any necessary alterations made to the type, the forme is then ready for taking the mould or matrix, which will be used for making the rubber die.

The moulds used in modern methods of manufacture are either of plastic or rubber substance. Prior to their introduction, they were made from plaster of paris and certain other materials, such as china clay, to form a bond strong enough to take the heavy pressure used to mould the rubber die. This type is still used in certain circumstances and by some manufacturers.

With the modern method, a sheet of the special plastic material is laid on top of the type in the forme, both of which are then placed between the platens of the vulcanising press, which is heated to 250° F. The press is slowly closed until contact is made with the plastic. Gentle pressure is then applied to obtain the correct depth of impression. This is usually obtained by the use of stops on the press. After approximately fifteen minutes the mould (or more correctly speaking the matrix) is then ready for the taking of the rubber die. Other type moulds require variations in processing but produce the same result.

A sheet of uncured rubber is now laid on the matrix, both are put back into the vulcanising press under heavy pressure for about five minutes to cure the rubber. After this the rubber die can then be peeled away from the matrix.

The rubber die is then usually mounted on a sponge rubber base; both are then fixed to the base of either a brass, wood, or perspex mount, on to the top of which is spigotted a wooden handle.

Often the wording of the stamp is printed on the uppermost side of the mount, visible to the user. Such stamps are called "Index" stamps, which simplifies the correct selection of a stamp from a number in use and assists in using the stamp the correct way up.

The latter is sometimes indicated by a small indication tack on the handle.

Another type of mount is the wood moulding. The mount and handle is one piece, the upper portion being shaped to facilitate use. These are principally employed for factory and warehouse requirements.

Whilst rubber stamps generally require the use of an endorsing pad to ink the stamp, some are self-inking, thus obviating the use of a separate pad. There are several ways in which this can be done, including some patented devices. In all cases the impression is obtained immediately the stamp is pressed to the paper.

Types of Stamp

Broadly speaking, there are two types of stamp:

(*a*) Stock stamps, such as date stamps or stamps with common commercial phrases or abbreviations; and

(*b*) Stamps made specially to order.

Stock Stamps: These may be ordered from the manufacturer's catalogue, which is generally fully illustrated, so that style and size may be selected with certainty.

Special Stamps: With this type, great care must be exercised when ordering, for once a stamp is made it is not always possible to alter it. The wording required should be written in block letters, and when a particular style of type face has been chosen from a catalogue the reference number should be indicated.

Unless the stationer, or the customer, has a thorough knowledge of type faces and sizes, a rubber stamp should never be ordered in a given style, to a given dimension. The reason for this is that a customer frequently requires to order a rubber stamp of a definite length, and, where a particular style of type is chosen, this is often too large or too small in relation to the length. It is better, therefore, when a rubber stamp is required to specific dimensions, to leave the size of type to the discretion of the manufacturer.

Some makers' catalogues, however, are designed to aid the stationer in helping the customer to choose a style for a given dimension, and pages of type faces are set out to a definite length to enable the number of letters per line in the stamp required to be checked against the space occupied by the number of letters in the catalogue.

When writing out the matter required for the stamp, the stationer should be careful to display it exactly as the customer requires it or, better still, he should persuade the customer to make out his own copy.

Again, in the order, the stationer must remember to indicate if there is to be a border around the wording, and to refrain from

14 pt.
British Stationery & Office Equipment 123456789£

14 pt.
BRITISH STATIONERY & OFFICE EQUIPMENT

18 pt.
British Stationery & Office Equipment

18 pt.
BRITISH STATIONERY & OFFICE E

24 pt.
British Stationery & Office E

24 pt.
BRITISH STATIONERY & O

30 pt.
British Stationery & Offi

30 pt.
BRITISH STATIONERY

36 pt.
BRITISH STATIO

Examples of Type Style and Size to Enable Choice of Same for a Given Dimension.

putting in lines unless they are required. This is a common error, particularly when a stamp is ordered to a definite size. Orders for oval or circular stamps should be accompanied by a rough sketch showing the correct position for the wording.

Where a facsimile signature stamp is required the customer should sign his usual signature two or three times on hard surface paper. This will be sent to the makers, who will make a woodcut from which the rubber stamp is produced. The woodcut will be returned with the stamp and should be handed to the customer as it will be required for repeat orders.

Rubber stamps, and in some cases rubber dies, may be ordered for particular purposes and for use with special inks. This must be indicated on the order, as the ordinary rubber stamp is made from a type of rubber which is suitable only to be used with endorsing ink on paper or a similar substance.

Where rubber stamps, or rubber dies, are required to be used for marking on metal, glass or similar substances, a special ink is needed which would be harmful to the type of rubber used for ordinary commercial stamps. This applies equally to stereos ordered by printers. It will be necessary in this case also to find out the kind of ink that will be employed; if this information is given to the maker, the correct type of rubber will then be used.

It thus follows that ink should be supplied for use with rubber stamps according to the purpose for which they are required, and care should be taken not to supply the wrong sort of ink. Metal stamp ink, for instance, should *never* be supplied for use with the normal type of commercial rubber stamps.

Rubber Daters

There are several types of rubber daters, but those in most common use come under three main headings:

(*a*) Line daters;
(*b*) Hand daters; and
(*c*) Cushion daters.

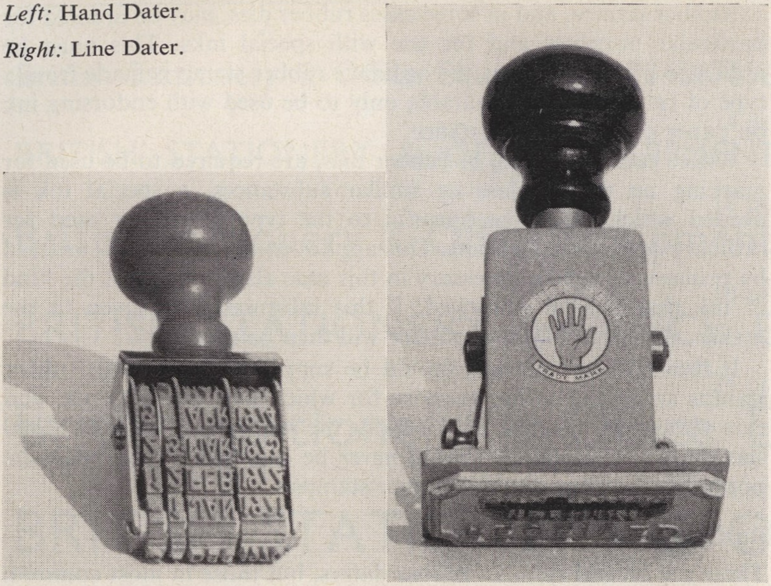
Line Daters: These are often called, rubber band daters, and consist of a metal frame on which a set of four rubber date bands is mounted. These may be revolved by means of knurled wheels, and, since one band carries the year, another the month, and the remaining two the days, it is possible to set whatever date may be required by the simple process of turning the wheels.

Daters of this type may be supplied with an extension bar which has a code letter or word either before or after the date. This gives rise to the name "prefix" or "affix" line dater.

These daters may be obtained in several stock sizes and they are produced for many special purposes—*e.g.*, dating railway season tickets, or to fit a given space.

Hand Daters: Similar in principle to line daters, in that the dates are formed by four rubber type bands. The date is usually in the centre of a rubber die-plate which carries some fixed wording—*e.g.*:

PAID
17 FEB 1968
WITH THANKS

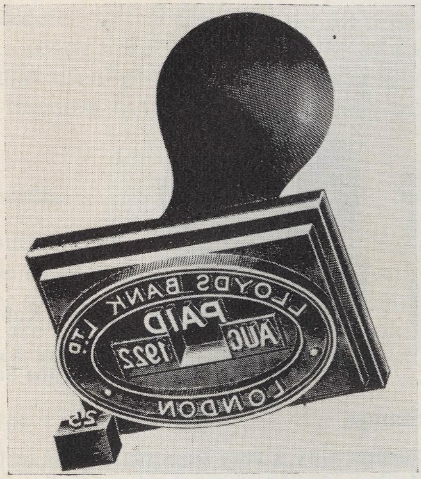


Left: Hand Dater.

Right: Line Dater.

The rubber die, which forms the base of the stamp, has an oblong opening in the centre into which the date type fits exactly. The die-plate is hinged, and when it is locked in position the date portion of the stamp cannot be rotated, and it is held in the same plane alignment as the rest of the type. To alter the date, the die-plate has to be opened on its hinge to expose the rubber type date bands: the point of a pencil, or some other similar instrument, is then inserted between the types, and the bands are rotated to the required date, which is then locked in place by closing the die-plate. This style of stamp is of solid construction. Brass is often used, but modern methods of production favour die-castings, which are much lighter. In general, the date bands are mounted centrally, in order to secure even pressure in the use of the stamp.

Cushion Daters: Also incorporate fixed wording and a changeable date. Unlike line daters and hand daters, however, they have no form of mechanism at all, and the rubber date type is quite separate from the stamp and has to be handset. The stamp mount is fitted with a thick moulded rubber cushion, and it bears on it whatever fixed wording it may be required to use in conjunction with the date. In the centre there is a slot, of a depth of about $\frac{3}{8}$ in., and, into this, loose rubber type, which is supplied with the stamp, is fitted by hand to form the date. The date is made up of three type blocks of equal width: one for the day (the set of type is numbered from 1—31), another for the month, and the third for the year. Alternatively, single rubber blocks, known as "logo type," bearing a word—*e.g.*, "received," "answered"—and of a width equal to the three date blocks, may be fitted into the stamp, thus giving it a dual purpose.



Cushion Dater.

This style of stamp has the advantage that the slot for the date may be positioned anywhere in the die and not necessarily in the centre of it, as is the usual practice with the hand dater already referred to.

Rubber Band Stamps

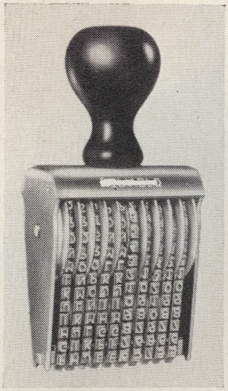
These are similar in construction to line daters, but instead of being made up with date bands they carry letters of the alphabet. Their normal use is for code-marking goods and catalogues, and any desired combination of letters, figures or signs may be obtained, with anything from one to twelve rubber bands.

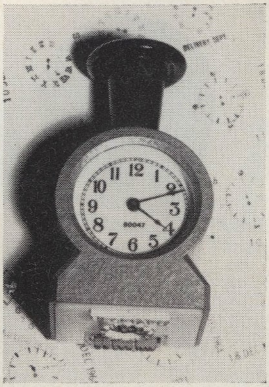
On the same principle are rubber numberers, which carry anything from two to 12 bands, each of which has on it the figures from 0—9. They can be obtained in several different styles and sizes of type face.

A variant of this style of stamp possesses a single rubber band, bearing whole words in common commercial use, such as "filed," "checked," "passed," "cancelled," etc., and these words will be supplied by the manufacturers in accordance with the requirements of the customer.

Price-Marking Stamps

The advent of self-service into modern selling methods has created a demand for price-marking stamps that contain figures and cash signs. These band stamps are capable of marking a large range of prices, and are obtainable in self-inking models and as ordinary band stamps for use with endorsing pads.





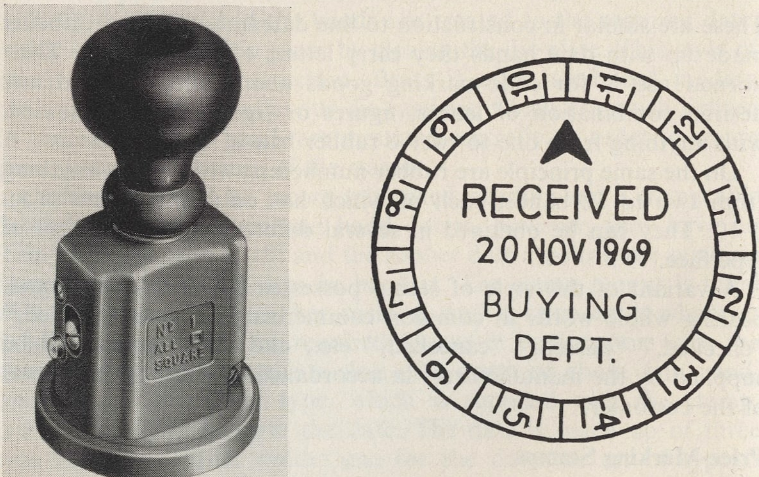
Left: Rubber Band Stamp.

Centre: Key Winding Clock Time Stamp.

Time and Date Stamps

Time and date stamps play a very important part in the commercial world today. Modern business methods call for the dating and timing of most of the incoming mail, orders, etc., received from customers to ensure proper rotation for manufacture and dispatch. In fact, there is a regular need for a time and date stamp in every office, factory and warehouse.

They can be obtained incorporating a key-winding clock and, where large quantities of documents are dealt with, an electric



Right: Hand Set Time Stamp and Impression.

model is available. In cases where security is important, time and date clocks can be supplied constructed in such a way that, once started, the hands cannot be reset except by an authorized person.

Another type is one in which the time is set manually. This is similar to a hand dater, in that the dates are on movable bands and positioned in the centre. The printing surface of the stamp incorporates a clock dial, usually in quarter hours and hours. This can be turned and the required time positioned against a fixed indicator arrow.

Sign Marking Outfits

Sign marking outfits comprise an alphabet of letters and figures, fractions, and the usual cash value signs, and are similar in construction to a rubber stamp, having a rubber face mounted on wood moulding. They are mainly used for small signs and ticket printing. The standard sizes of characters vary from $\frac{3}{8}$ in. to $1\frac{1}{2}$ in.

Solid Rubber Type

This is a range of deep-moulded rubber type made to a standard body height, with a soft printing face on a hard base to fit into specially constructed chanelled holders. The standard outfits comprise:—

(1) 5A fount of capital letters and figures
(2) 5A. 6a fount of capital letters, small letters, figures, etc.
(3) 5A. 3a fount of capital letters, small letters, figures, etc.
(4) Sets of datepieces comprising 31 days, 12 months and 6 year pieces.

Note: The smallest size of characters that can be supplied in solid rubber type is $\frac{1}{8}$ in. face. The largest is 1 in.

Printing Outfits

Office Printing Outfits: Similar to solid rubber type, but of much cheaper construction. They are used in offices to compose small temporary stamps for immediate use. Many are sold for educational purposes to schools.

Industrial Printing Outfits: These have a much wider field of use, particularly in carton printing and code marking. The rubber type used has a grooved base designed to press into a grooved holder. This method enables the type matter to be correctly positioned without the use of spacing material; once positioned it will not fall out. The type holders can be supplied curved or in roller form for continuous printing. Standard type sizes are from $\frac{3}{16}$ in. face up to 1 in., with larger sized characters available to special order.

Metal Stamps

Metal numbering machines, daters, etc., are used in all branches of commerce and industry, where the need arises for coding, classifying, enumerating, dating, counting, etc. Although there are many standard applications, specialised requirements are numerous. Most needs can be met by a wide range of stock machines, or by specials made to order. Modern machines are precision engineered, and will operate satisfactorily for many years with little maintenance. It should be noted, however, that only specially formulated ink for these machines should be used. Rubber stamp ink should never be used as it corrodes the metal wheels.

Numbering Machines

There are three main types of hand-operated numbering machines; Automatic, Lever movement, and Non-Automatic, each provided with self inking facilities.

They are fitted with either alloy or steel printing wheels. Alloy is suitable for normal office requirements. Where heavy duty work is involved, such as printing through multipart sets, steel wheels are more suitable. Figure styles usually include Roman and Sans Serif, in character heights of up to 6 mm. The frames are mostly made from steel, but an unbreakable rigid plastic material is now being used.

The machines operate by downward pressure on the handle which first swings the ink pad away from the printing wheels, and then brings the line of figures into contact with the printing surface to be marked, to produce an impression of the required number. The handle which is spring loaded, is then allowed to return to its original position. This movement retracts the printing wheels, and at the same time causes the wheels to be re-inked by the ink pad.

Automatic: This type of action operates on up to a maximum of six printing wheels, and may incorporate a number of different movements, any one of which may be chosen by the setting of a simple selector device. The change of number, in accordance with the setting, is effected automatically and simultaneously with the retraction of the printing wheels after an impression has been made.

The number of movements is dependent upon the number of wheels, but on a standard six wheel machine, eight movements can be arranged, the usual being:—

(1) Repeat—the figure wheels do not move so that any number which is set is printed repeatedly.

(2) Consecutive—prints consecutive numbers, *e.g.*, 1, 2, 3, *et seq.*

(3) Duplicate—each number is printed twice, *e.g.*, 1,1; 2,2; 3,3; *et seq.* before the next one moves into position.

(4) Triplicate—as above, but each number is printed three times.

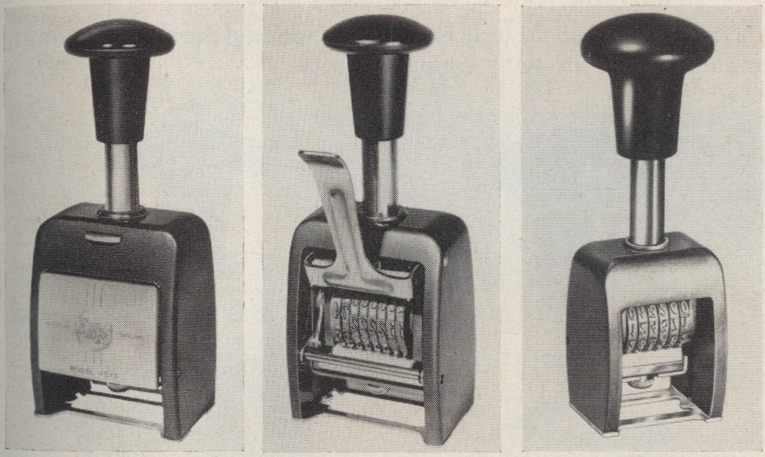
(5) Quadruplicate—as above, but each number is printed four times.

(6) Quintuplicate—as above, but each number is printed five times.

(7) Sextuplicate—as above, but each number is printed six times.

(8) 12 times Repeat—as above, but each number is printed twelve times.

Automatic machines can be supplied with more than six printing wheels, but such additional wheels do not move automatically and require changing with the use of a stylo. Furthermore they can only be provided by reducing the number of different movements available.



Left: Automatic Numbering Machine.
Centre: Lever Movement Numbering Machine.
Right: Non-Automatic Numbering Machine.

Lever Movement: These print the same number each time the machine is operated. The next number in sequence is obtained by manual operation of a lever or depression of a button, on up to six wheel machines. Additional wheels are altered by stylo.

This type of machine is particularly useful where a constantly varying quantity of documents is required to bear the same number, *e.g.*, photographic prints, shipping documents, airway bills, etc.

Non Automatic: Although similar in design and operation to the machines already described, all figures have to be changed manually with a stylo. Standard models, are usually five or six wheels, and they are used where sequential numbering is not required.

This type of machine can also be fitted with wheels to print prices in sterling or many foreign currencies, for the purpose of price marking. It is also useful for printing price labels.

Metal Daters

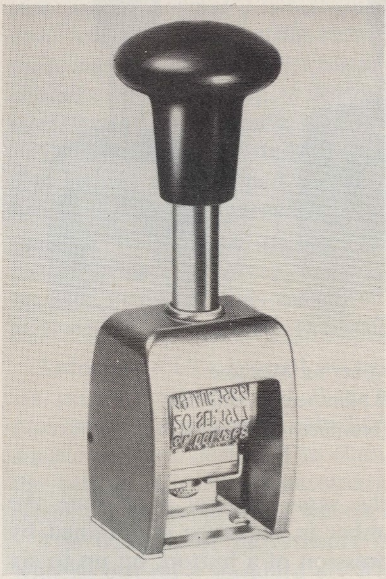
These are similar in construction and operation to numbering machines, but print the day, abbreviated month and year. Month abbreviations are readily available for many foreign languages, English or Roman figures. The wheels can be arranged to print the month before the days, as used in North America.

There are two main types:—

(1) Non-automatic, on which the wheels are changed by a stylo.

(2) Lever change, on which the days and months are changed by a lever, the years being altered by stylo.

Daters are used for cancellation of National Insurance Stamps, in libraries and for many dating purposes.



Self Inking Date Stamp.

Combined Numbering and Dating Machine.

Combined Numberers and Daters

Automatic and Lever movement numbering machines can be arranged with dating sections, the latter being changed by the use of a stylo. The dating and numbering wheels are located side by side and the date can precede or follow the numbers.

The additional space required for the date, limits the number of variable movements, which is generally not more than five, including repeat and consecutive. Not more than six numbering wheels are normally available.

This type of machine is used for incoming and outgoing mail, file referencing, betting slips, etc.

3mm 123456
4.5mm 123456
5.5mm 123456

3mm 123456
4.5mm 123456
5.5mm 123456
6mm 123456

L.99999 Fr1. 24. 35.
Fr123. 45 Fr12-45
Fr12345 23Kr.45
375$57 $999. 99
DM123. 45 224DM80
NF3. 31. 39. Kr. 123. 45
E° 123. 45 £9. 19. 11.

3mm 22.NOV69 567890
4.5mm 30.NOV68 567890
5.5mm 15.NOV70 567890

Specimen Impressions:
22. SEP. 1985 English Style
DEC. 31. 1985 American Style
27. -12-1985 Figure Month
23. VII 1971 Roman Month

3mm 23.FEB78 567890
4.5mm 22.NOV69 567890
5.5mm 12.FEB75 567890
6mm 30.NOV75 567890

3mm 25 FEB 1987
4.5mm 27 NOV 1985
5.5mm 25 APR 1978

Facsimile Impressions.

Special Numberers and Daters

In addition to the wide variety of stock machines, others can be supplied embodying special features such as prefix or suffix numbers, letters, symbols, sharply cut characters for printing through carbon paper, film or spirit masters, etc.

These machines can be automatic, lever movement, or non-automatic, in operation. They can be supplied mounted on hinged metal bases fitted with guide stops to ensure accurate location of each printed impression; or where numbers are to be imprinted in close alignment with typed and ones of figures, a spring steel outrigger can be provided on the frame. A resettable counter can be attached to the side of the frame to show total number of impressions. This can be a key reset to prevent unauthorized resetting.

These are produced to order to meet special requirements for coding, classification, identification, control systems, etc. Typical applications include:—

Numbering spirit duplicator masters.
Overprinting labels.
Skip numbering (odd or even numbering).
Multi impressions through carbon sets, etc.
Printing of sizes on shirts and collars.
Doubles and Trebles numbering on football coupons.
Printing of pictorial or mathematical symbols, etc.

Die-plate Stamps

An adaptation of the metal date or numbering stamp provides a die-plate on which any lettering can be engraved, such as "received," "paid," "answered," "certified," "company name and address" etc., for use in conjunction with the date or number. This is something on the lines of the rubber hand dater. These die-plates are often interchangeable, and, as the alteration from one to another is a very simple matter, any number of die-plates may be used with the same machine. As they are individually engraved they of course cost more than machines without them.

An example of this style of metal stamp is the ordinary Post Office date stamp. The fixed wording around the circumference is the name, or address, of the office, and in the centre there is the changeable date.

Validating Machines

These have been specially designed for certifying documents and are extensively used by airline companies, travel agents and large commercial houses. Impressions are made by means of a ribbon, and the machines are usually self-inking.

Special features:

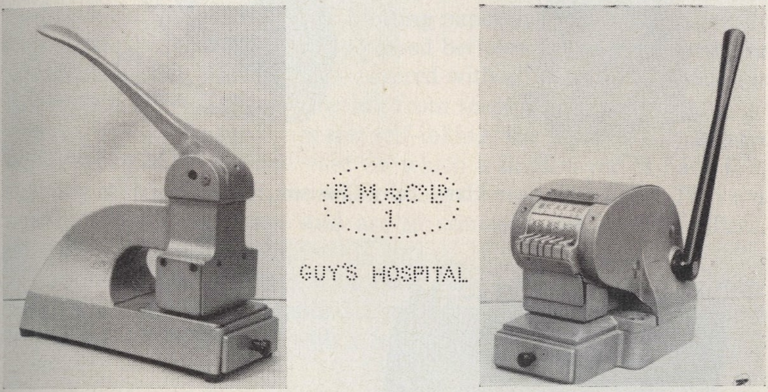
Up to eight copies of carbon backed paper stamped at one time;
Automatic ribbon feed;
The printing plate is interchangeable;
The dating unit is perpetual.

The total printing die area is $1\frac{3}{16}$ in. × $1\frac{3}{16}$ in.

Perforating Machines

These machines have many uses, but are chiefly for permanent and positive marking. There are two main types of machine:—

(*a*) with fixed design—used for marking materials such as paper, cardboard, X-ray film, fabrics, skins, plastics, and certain metals such as lead and thin alloys.



Perforating Machines (a) and (b) and Typical Perforations.

(*b*) with or without fixed design, but incorporating movable units—used for dating, marking, numbering or cancelling cheques, labels, coupons, cash bills, travel tickets, etc., and used mainly by banks, tourist agencies, large stores and the canning and bottling trades.

They may be operated by hand, treadle or power, and locking devices can be incorporated to prevent unauthorized use. It is advisable, when ordering, to send a sketch or specimen of the material to be perforated, showing the position where the marking is required.

Hand Tally Counters

These are devices for rapid and accurate counting, and typical applications include traffic census work; recording of attendances at meetings, exhibitions, receptions, etc.; passenger loading; cattle counting, etc.

The count is achieved by depressing a plunger or lever, each depression registering one count. They are usually four figure capacity, registering to 9999, the total count being visible through a small aperture. A reset knob is provided for resetting to zero.

Models are available that are designed to fit into the palm of the hand and are prevented from slipping by a convenient retaining chain; or to be mounted on to a desk, counter or clip board etc.

Hand Tally Counters.

3346
3408
3374
3386
5632
5617
5584
5575
5564

Multiple Hand Tally Counters.

They can also be supplied in banks of two or more for use where it is necessary to record under several headings.

A limited number can be so arranged for hand use, or an unlimited number can be mounted on frames, for desk or counter use, with label holders fitted above each counter for identification purposes.

Endorsing Pads and Inks

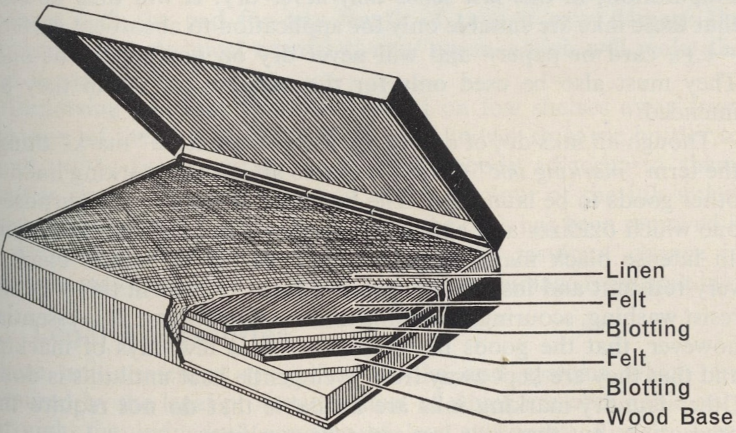
Endorsing Pads

The majority are most commonly used in conjunction with *rubber stamps*, and are normally supplied in three sizes and with five colours of ink. The sizes are Nos. 1, 2, and 3, measuring approximately $3\frac{3}{4}$ in. × 2 in., $4\frac{1}{2}$ in. × $2\frac{3}{4}$ in., $6\frac{1}{2}$ in. × $3\frac{1}{2}$ in.: larger sizes may be obtained specially to order. The colours are black, blue, green, red and violet.

These pads are made in various styles, but the one in most common use is linen-covered. It consists of a wooden base on which are placed alternate layers of felt and blotting paper. The wooden base is first impregnated with paraffin wax to make it non-absorbent, and then the layers of felt and blotting paper are added, after having been soaked in an ink bath and passed between rollers to remove the surplus ink. The whole is then covered with a linen "skin," which is properly sealed to prevent the ink from seeping into the tin.

For *metal stamps* that are not self-inking, the pads usually have a wax-impregnated wooden base on which a thick layer of hard felt, suitably inked, is placed, the whole being covered with linen. They are usually circular in shape and are in common use in post offices, railway offices and banks.

Endorsing pads for use with *linen marking ink* are not impregnated with ink, but are supplied dry. The specially made ink is applied to the surface of the pad with a brush as it is required for use.



Endorsing Pad in Section.

Endorsing Inks

Most inks are made up for retail sale in a number of sizes, *i.e.*, $\frac{1}{2}$ oz., 1 oz., 2 oz., 4 oz. In addition, for large users, they can normally be obtained in half pints, pints, quarts and even gallons. Types of container varies according to supplier.

The usual colours for rubber stamp ink are black, blue, red, green and violet. For metal stamp use, red and black is in most demand, but other colours are obtainable. Marking ink is usually black, although other colours are available for the marking of dark coloured materials.

Inks used with rubber or metal stamps are first applied to the stamps by means of an impregnated pad. As these pads are uncovered during much of their working life it is essential to ensure that the inks do not dry out before they reach the surface on to which they are to be stamped. With rubber stamps it is customary to use inks that contain large concentrations of dyes dissolved in glycerine, with or without water; such inks are usually termed "*endorsing inks*."

With metal stamps, whilst it is often possible to use a glycerine-based ink, it is more usual to employ inks consisting of pigments (insoluble colouring matters) ground in oil (mineral or vegetable) and sometimes tinted with soluble dyes. These latter are termed "*metal-stamp inks*," though they may be used also with high-speed endorsing machines—there is no practical difference between endorsing and stamping. Typical uses for metal-stamp inks include postal franking, numbering and ticket-issuing machines.

Since the inks of both types are non-drying, they dry on the surface to which they are applied through absorption and *not* by evaporation; in this last sense they *never* dry. It will thus be clear that these inks are suitable only for application to absorbent surfaces —*e.g.*, card or paper—and will never dry on non-absorbent ones. They must also be used only for the purpose for which they are intended.

Though all inks do, of course, by their very nature "mark" things, the term "*marking ink*" usually refers to an ink for marking linen or other goods to be laundered. The best type of ink for this purpose is one which oxidizes and ages after the goods are marked, producing an intense black mark through the formation of aniline black, a very resistant and insoluble pigment. Marks formed in this way will resist washing, scouring, bleaching and even scrubbing. It is essential, however, that the goods be washed within a few days of marking and that they are kept away from even gentle heat until this is done. Other laundry-marking inks are available that do not require this precaution, but they give less resistant markings.

The aniline-black type of marking ink must be kept in a bottle and applied by means of a pen; the bottle must be kept closed when not in use to avoid oxidation of the ink. Other, non-oxidizing types do not require this precaution and may also be applied from stamp pads.

British Standards are published on marking inks for stock purposes, domestic use, laundry and dry cleaning purposes and for marking dark coloured fabrics. The Standards require manufacturers to provide instructions for use with each container of ink.

It is essential that users should follow these instructions meticulously, as otherwise the marked fabric may be damaged. Similarly, particular note should be made as to the suitability of the ink for a particular fabric.

Certain other more specialized inks are available, usually to special order. These include opaque inks for stamping on metal, stone, glass, special inks for marking food, etc. Unless details are clearly set out in manufacturers catalogues, the supplier should always be advised the purpose of the ink and method by which it is applied, etc., so that the correct grade and specification is obtained.

Finally it must be stressed again that when re-inking a pad, no different class of ink to the original should be used.

Storage

Endorsing pads of all inked kinds must be stocked flat and in a cool, dry place. When they are stored in damp conditions the glycerine in the ink attracts moisture from the atmosphere, causing the ink to ooze out of the pad, and out of the tin, so that it may damage other stock with which it is in contact. Similarly, if they are placed on edge the ink will gravitate to the lowest level, and may run out. Care must also be taken that lids of pad tins are not crushed by other goods stacked on them, for if the lid is in direct contact with the pad for any length of time it may damage the surface, when chemical corrosion may occur, which will make the pad unsaleable.

Endorsing pad inks should be stored on low shelves away from the rays of the sun, as these have been known to cause bottles to burst, with disastrous results to other goods adjacent to them. Bottles should not be opened to test the colour of the ink unless they are fitted with screw caps, as once the cork has been removed it is difficult to re-insert it correctly, and the resultant change in pressure may cause it to come out and lead to damage from spilt ink.

5. Legal Accessories

There are numerous specialized books and systems which are required by the legal profession, most of which are obtainable only through the individual services of law stationers. Certain legal sundries are, however, more frequently met with and these are dealt with in this section.

Seals

Several different types are available, in order that the many legal documents and forms can be "signed, sealed and delivered."

Brass Chequered Seals: The seal was originally made of sealing wax impressed with a brass chequered seal. They are not, however, very much in use today.

Wafer Seals: The brass chequered seal has now given way in popularity to a gummed red paper seal, with an embossed chequered pattern, known as a wafer seal. These seals are available in several sizes, the most commonly used having a diameter of about $\frac{5}{8}$ in. Self-adhesive wafer seals are also available.

Gummed wafer seals are normally boxed in 100's and self-adhesive wafer seals in boxes of 500.

Company (or Notarial) Seals: These are gummed red paper seals with a serrated edge. A range of sizes is available, but the most common size in use is No. 13, which has a diameter of approximately 2 in. These seals are also available as self-adhesive. Both styles are boxed in 100's.

The seal is affixed to the document being sealed and is then impressed with the company's seal.

Paste Wafers: These give depth to a seal, and were originally made from Canadian white flour. Nowadays they are used almost solely for ecclesiastical seals.

Pounce

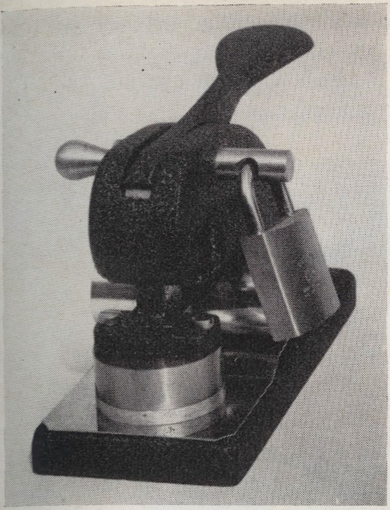
This is a powdered preparation, made from whiting, french chalk and resin, used for preparing parchments to accept ink.

The Company Seal Embossing Press

Company seal embossing presses are similar in construction to ordinary address embossing presses, but they are normally larger in size. In nearly every case the dies are round and have the title of the company engraved centrally between two circular rims, the outer rim occasionally being ornamental, in the form of a rope or pointed edge design, though the majority of seals have plain borders, with the word "limited" across the centre. Chartered companies, municipal undertakings and similar organizations frequently require the centre of the seal to be engraved with a coat-of-arms or trade mark or similar device.

Great care must be exercised when taking orders for these presses, and the manufacturer will require to know whether the press is intended to stamp at the bottom, side or top of the document, so that the press may be assembled accordingly. Unless it is stated to the contrary, company seals are always made to emboss at the bottom of a document.

In order to prevent unauthorized use, it is normal for the company seal to be fitted with a locking device. The lever is usually secured by a steel bolt, passing through the upper part of the frame, the outer end of which is drilled to carry a padlock. When this is unlocked and removed the bolt can be withdrawn and the lever is freed for use. Often, for further security, either two different padlocks



Company Seal with Locking Device.

are used or one lock which can be opened only by the operation of two different keys. In either case the appropriate keys are held by separate officials authorized to operate the seal on the company's behalf.

Tying and Sewing Materials

The principal items used are:—

Pink Tape: This is used for tying bundles of documents, the most popular width being ⅜ in. It is available in skeins of 9 yds. and rolls of 36 yds., 100 yds., 250 yds., 500 yds. and 1000 yds.

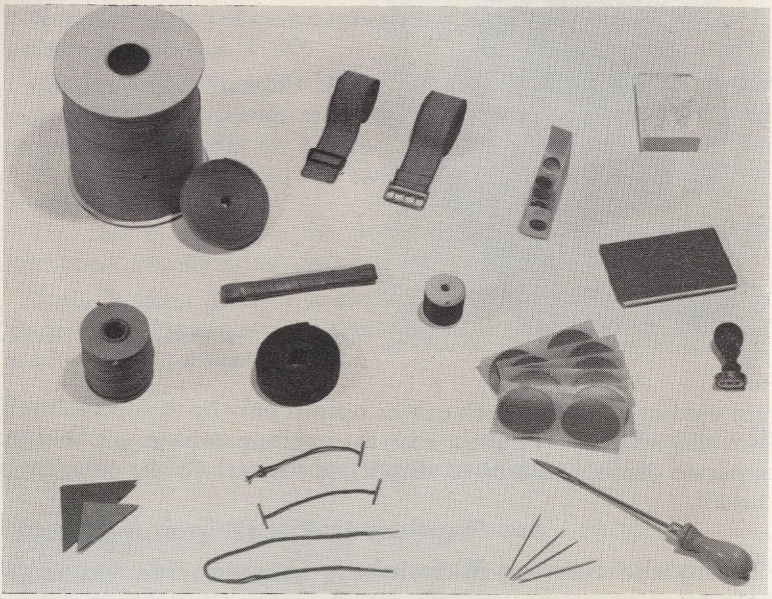
China Grass: This is used for sewing all engrossments and pleadings and is made of green mercerized cotton. The unusual name stems from the fact that it was originally used in the china (porcelain) trade. It is normally supplied on cards containing 30 yds. of approximately ⅛ in. width, but is available also on reels of 144 yds., 250 yds., 500 yds. and 1000 yds.

Ferret: This is used on wills and for affixing seals on conveyancing work. It is made of a green silk material in two widths—narrow ½ in. wide, and broad ¾ in. wide. Both widths are supplied in rolls of 18 yds.

Silk Cord: This is green in colour and is used instead of china grass for sewing documents. It is supplied on reels of 30 yds.

Needles: These are used for sewing with china grass and silk cord. Two sizes cover most needs—No. 16 supplied in packets of 25 and No. 17 supplied in packets of 6.

Bodgers or Bodkins: These are available either with or without an eye. Bodgers without an eye are used for pre-making holes in thick documents before sewing. Bodgers with an eye are used for sewing and eliminate the need for a needle.



Legal Accessories.

Fasteners

Treasury Tags: These are available in various lengths normally ranging from 1 in. and then every ½ in. up to 12 in. The papers to be joined are usually punched first and a tag of the most suitable length inserted. They are quite versatile in use in as much as it is possible to fix them singly (usually at the top left-hand corner) or at spaced intervals on the side, top, or bottom of the paper. Their name originates from the fact that the Treasury Department at one time used only these for joining papers.

Tail Tags and **Spear and Sheath Tags:** These are variations on treasury tags.

Manilla Corners: These are small triangular pieces of manilla card used for strengthening when stapling papers together at the corner. They are available in most colours.

Deed Straps: These are available with ordinary or Bennett's patent buckle in various lengths normally ranging from 12 in. to 36 in. They are used for keeping bundles of deeds or books together.

Forms

Printed forms are available from certain firms specializing in law stationery. These forms cover all branches of the law and are far too complex to be dealt with in detail here. Many of them are subject to a copyright.

6. Packaging and Sealing Accessories

This section is so titled, in order to classify those items used for the purpose general wrapping and parcelling. Broadly they may be categorized in three main groups. Firstly materials used for the inner and/or outer wrapping of parcels; this also includes certain purpose made containers. Secondly, ancillary materials used to effect closure of the parcel. A third group could also be included covering products and methods used for the addressing, marking and identification of parcels; *i.e.*, labels, tags, etc. However, it has been found more convenient to deal with these articles in a separate section.

The entire field of packaging and sealing covers very many materials and products, but the requirement of this section concerns only those items usually purchased from the stationer for general requirements.

Wrapping Papers

Paper manufacture and classification of the various types of paper are dealt with at a later stage. The following information, therefore, is of an introductory nature.

Types

Wrappings cover a wide field of different kinds of paper, but the principal type in general use is known as kraft.

Kraft is a strong, brown paper available in both M.G. (machine glazed—shiny on one side) or unglazed finish. The quality will vary considerably according to the nature of the pulp used in its manufacture.

The strongest grades are made from pure sulphate pulp, and the cheaper and inferior grades from mixtures of mechanical and pure sulphite.

M.G. krafts may be obtained either plain or ribbed. Ribbed indicates feint parallel lines showing on the top or shiny side of the paper which are impressed on the web of paper by a specially marked felt after it leaves the wet end of the paper-making machine.

Imitation kraft indicates the poorer qualities made with a proportion of mechanical wood.

Apart from kraft, other groups of wrappings are the sulphites, made, as the name indicates, from pure sulphite pulp. They are M.G. finished and are available in white and colours, generally carrying a broad stripe. Covering, as they do, a very wide field, many different substances or thicknesses are available for particular requirements.

Specialized wrapping papers would include heavy weight duplex krafts, bitumen centred, thus making them waterproof. For additional strength, when required, such laminations would include glass, nylon or sisal fibre constructions.

For specific requirements, such qualities as greaseproof, tissues, both waxed and plain, glazed transparent, vegetable parchment, etc., are all in use.

It is vitally important in choosing a suitable wrapping material to give considerable thought to the physical requirements, especially in relation to the ultimate hazards in usage and in transport to which a particular pack may be subject.

Uses

In view of the very many different types, grades and substances of wrappings, coupled with the factors concerning usage, it is not possible to be specific as to a particular paper suitable for a particular purpose. Where necessary, guidance should be sought from the supplier. More common and general uses of the principal types are as follows.

Kraft: For every type of merchandise where minimum thickness combined with maximum strength is required.

Imitation Kraft: For inside wrappings where the parcel is included in a larger parcel. In heavier substances for outside wrapping of goods sent by rail or post.

Bitumen Kraft: For use where waterproofing and similar protection is necessary.

Browns: A substantial wrapping for fairly heavy goods and for articles of bulk rather than weight.

Fine Wrappings: Postal wrappings; cotton and linen goods; drapery and millinery; flowers; confectionery; and protective purposes.

Tissues: Individual wrapping for fragile and delicate articles; general utility wrapping for light articles; millinery, drapery and haberdashery; jewellery; confectionery; instruments.

Waxed Papers: Individual wrapping for metal components; food stuffs; carton overwrapping; case lining.

Greaseproof: Greasy foodstuffs; biscuit wrapping; cooking fats; surgical dressings; and other special applications.

Glazed Transparent: Food products; medical products; photographic products; small component parts etc.

Vegetable Parchment: Dairy products such as butter, margarine, cooking fat, etc.

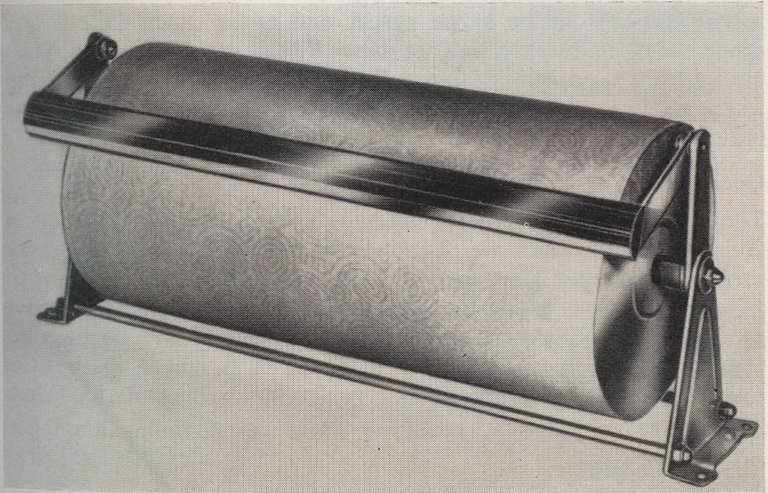
A British Standard is published which sets out the various types and uses in some detail.

Size and Length

Most wrappings are supplied in both sheet and roll form. Common sheet sizes are 20 × 30, 29 × 45, and 36 × 46 in. Rolls are generally stocked in widths of 10, 15, 18, 20, 30 and 36 in. The length in a roll will, of course, vary according to substance, but as a general guide there would be approximately 570 yds. for a 20 in. × 30 in. 19 lb. kraft and 425 yd. for a 20 in. × 30 in. 27 lb.

Counter Roll Holders

Counter roll holders are available for easy dispensing, providing the most suitable size sheet for any pack with a minimum waste of time and material. Such holders are made in a range of widths to suit the kraft roll sizes, from 10 to 36 in. Modern holders are of a universal nature, being adaptable for bracket, hanging or standing fitting on counters or packing benches.



Counter Roll Holders.

Corrugated Paper

While there are several different types of corrugated paper, such as the delicate fine flute chocolate glassine found in chocolate boxes or the fine flute greaseproof variety used in biscuit tins, the student will come into contact far more often with rolls and sheets of corrugated strawpaper universally used in packing rooms, and it is this type that will be considered in this section.

Manufacture

The raw material is strawpaper. This is a very cheap quality of paper, made chiefly from waste paper, but it is adequate for this class of wrapping. During manufacture two continuous sheets of strawpaper are drawn from two rolls and pasted together on the corrugating machine. One sheet is flat and forms the "backing" and the other is corrugated by a roller on the machine and forms the "flute." The flutes absorb any shock that might damage the article wrapped in the corrugated paper and it is obvious that the thicker the strawpaper used, the more rigid will be the corrugated paper and consequently the greater the resistance to shock. However, this can be overdone, and it is not always advantageous to use a more robust quality as this might damage delicate goods by transmitting all the shock without absorbing any of it.

Flutes

There are two standard flutes—*i.e.*, "coarse" flute and "fine" flute. The protective qualities are approximately equal—in the one case there is a deep flute and consequently more space between the article and the outside of the parcel, and in the other there is less space but more flutes, which are naturally smaller. Coarse flute rolls are generally used, but fine flute rolls have the advantage of occupying less space in the packing room as the overall diameter of the roll is reduced.

Quality

The standard quality is governed by the weight of a roll measuring 26 in. × 250 ft., which weighs approximately 30 lb. The strawpaper used is of a certain substance or thickness which produces a roll to this specification. Naturally, if heavier substances of strawpaper are used the roll will be stronger and its weight will be heavier. Heavier rolls available weigh 36 lb., 40 lb., 44 lb. and 48 lb., but the one universally used for general packaging weighs 30 lb. when 26 in. wide.

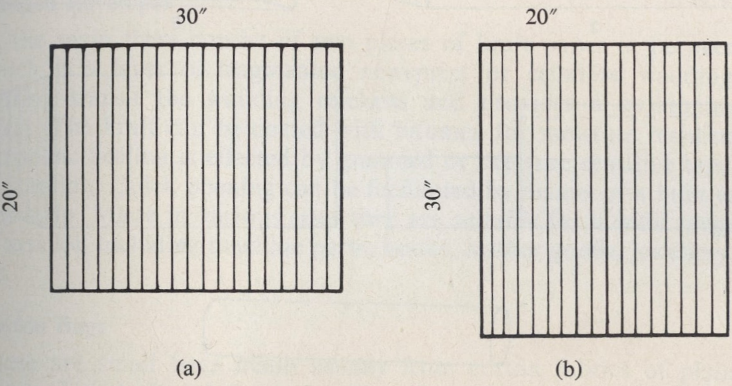
Size and Length

The length of the rolls, whatever the width, is always standard—*i.e.*, 250 ft. The most popular width is 26 in. but any other width from 2 in. to 78 in. can be obtained, although these generally have to be ordered specially, whereas the 26 in. roll can always be obtained from any stockist. As corrugated rolls are generally cut into any number of sizes, it is only necessary to use special widths if one of these suits a certain job and the use of any other width would cause waste.

Prices are proportionate—*i.e.*, a 26 in. wide roll would cost twice as much as a 13 in. roll or half as much as a 52 in. roll. There are reductions for quantities taken in one delivery.

Sheets

Sheets can be supplied as required and are cut from the roll by the manufacturer. However, two points should be borne in mind. Firstly, a sheet cut to a certain size is of little use except to wrap the article in mind, but practically any size sheet can be cut from a roll. Secondly, when ordering sheets care must be taken to decide in which direction the flutes are to run. When this has been determined it must be remembered that the flutes run parallel to the first of the two dimensions.



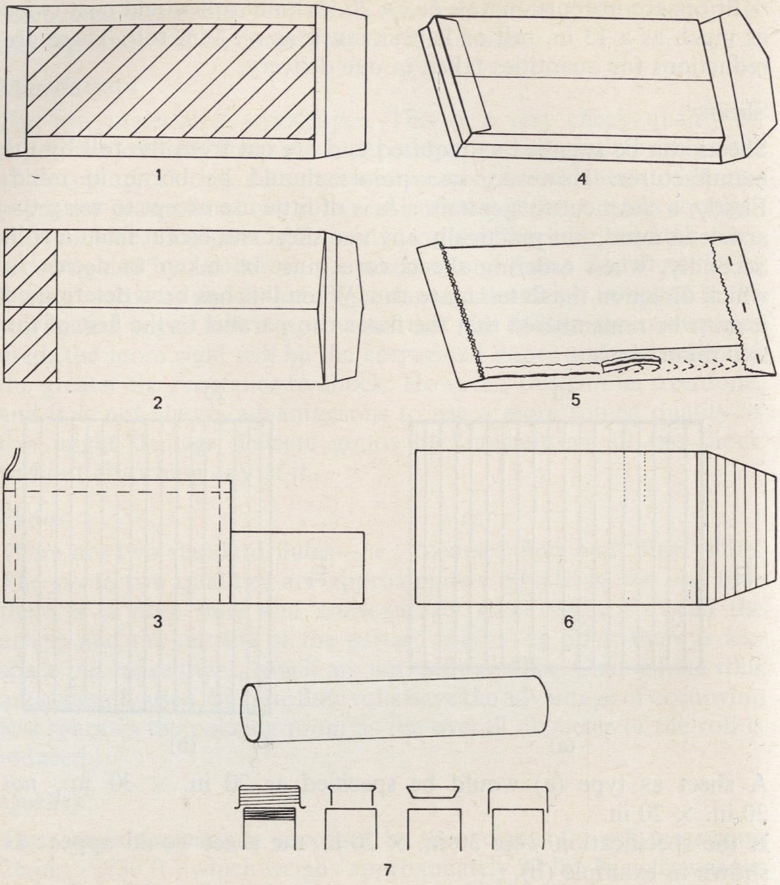
A sheet as type (a) would be specified as 20 in. × 30 in., *not* 30 in. × 20 in.

If the specification were 30 in. × 20 in. the sheet would appear as shown in example (b).

There is never any difficulty in obtaining strawpaper as this is chiefly waste paper; consequently there is no difficulty in obtaining corrugated rolls or sheets. Most stockists maintain a variety of popular sized rolls—*e.g.*, 18 in., 26 in. and 36 in.—and a few stockists maintain stocks in about twenty different widths. Cut sheets are not often to be obtained from stock, but they can be supplied by stockists with little delay.

Packaging Envelopes, Bags, etc.

While wrapping paper is essential for general use, there are many articles which can be packed more conveniently by the use of a purpose made product of one type or another. Such products not only facilitate the task of packing, but usually provide a greater degree of protection, particularly as the ability of many people, to pack a parcel often leaves much to be desired. Those items most



1. Board-Backed Envelope.
2. Solid End Envelope.
3. Cotton Bag with Label.
4. Gusset Envelope.
5. Padded Envelope.
6. Newspaper Wrapper.
7. Postal Tube and Various Closure Fittings.

likely to be asked for and sold over the counter by the stationer are summarized below. More detailed information on packaging envelopes and bags will be given in a subsequent chapter.

Board-Backed Envelopes

These give maximum protection to photographs, calendars, brochures, catalogues, showcards and similar articles, either in the post or in storage. Usually made from manilla and board of various qualities, in a range of sizes, they can be provided with tuck-in flaps or fasteners to comply with Printed Paper Rate or Sample Post regulations. For other uses they can be made with a transparent material to give visibility of contents.

Gusset Envelopes

These envelopes are made with a pleat so they can be expanded and are suitable for packaging and storage of bulky articles, such as small boxes or tins, metal and wood specimens, carpet samples, etc. Samples by post are easily mailed in this type of envelope, which can be made in a variety of sizes with different types of fastening.

Solid End Envelopes

Where there is risk of damage to the contents by stamp cancellation on an envelope, a solid end of approximately 1½ in. is incorporated on which the postage stamp may be fixed.

Padded Envelopes

In the main these consist of two pieces of kraft paper in between which is a layer of fragmented newsprint or cellulose wadding. During transit the wadding thickens and provides a cushioning effect. The kraft can be coated with bitumen for moisture resisting purposes. Sealing is effected by gummed or pressure sensitive tape, or stapling. Quick opening can be facilitated by means of a built in tear strip. Made in various sizes they are suitable for a wide range of articles, including machine parts, books, leather goods, jewellery, etc.

Cotton Bags

These are small bags made usually from cotton fabrics of plain weave, bleached and finished with a hem top and fitted with a drawstring closure. They are suitable for packaging small parts such as engineering spares, metal or plastics, etc. This type of bag is also extremely useful where small accessories have to be packed with their main component.

The cloth is durable and bags can frequently be used more than once for the same, or another purpose. It accepts branding or printing and small size type or designs can be reproduced clearly on it.

Although principally a product of the sack and bag making industry, the small sizes find a ready sale in the stationers shop. These are 5 in. × 3 in., 6 in. × 4 in., and 8 in. × 5 in. As they can be supplied with an address label stitched to one side, they are eminently suitable for sending samples or supplies through the post. For this reason they are also called "sample" or "postal" bags.

Postal Tubes

These are rigid cylindrical tubes usually made from paper and board, with ends of metal, plastic, or other material different from the walls. They are really part of a family of containers called "composites," many of which are used for packing powders, pastes, oils, etc. However, in the field of stationery they are used for sending papers, certificates, drawings, maps, etc., through the post in a rolled state to prevent creasing and damage.

The usual sizes are from 1 in. to 3 in. in diameter and from 10 in. to 30 in. in length. Thickness of the walls normally depends on the size of the tube; that is to say, generally, the larger the tube, the thicker are the walls.

For the small user, they are often sold without ends. However, bulk usage normally demands a method of closure and this can be provided by several types of metal lid, screw cap, or even a cork "bung." There are some patented proprietary lines employing different means of closure.

Similar tubes are now being made from plastic materials, usually with slip on ends. Both types are widely used for storage purposes and they are suitable for packing articles other than those already mentioned.

Newspaper Wrappers

These are made mainly from M.G. Manilla for the express purpose of sending newspapers and periodicals through the post at reduced rates of postage. The average length is 13 in. to 14 in. and they are obtainable in various widths.

The newspaper, etc., is rolled or folded in the wrapper and closure is effected by moistening one edge which is strip gummed. Some makes have a "tear strip" incorporated to facilitate easy opening.

Adhesives

Today there is an adhesive for almost every purpose. In addition to those used for sticking together traditional stationery materials such as paper, thin board and the like, there are many specialised adhesives sold by stationers, for such purposes as fabric and plastic repairs, china repairs, model making etc. Others are prepared for special industrial purposes, but are not usually sold by the stationer.

The raw materials for adhesives are obtained from very many sources and the composition and properties vary according to the nature of the work they are intended for. Broadly, adhesives can be classified according to the nature of the constituent materials, but within each group there are numerous sub-divisions and methods of manufacture. The information given is therefore confined to those adhesives that are generally sold by the stationer, together with such characteristics and uses that are considered to be helpful.

Classification

Adhesives can be classified according to the type of raw material used in manufacture. The following list has been extracted from the British Standard covering Adhesives for Packaging. Other Standards are published, covering certain of the categories individually.

(1) Natural Resins and Gums.
(2) Vegetable Adhesives.
(3) Animal and Fish Glues.
(4) Rubber Based Adhesives.
(5) Synthetic Resin Adhesives.
(6) Bitumous Adhesives.
(7) Protein Adhesives.
(8) Silicates and Silicate Mixtures.
(9) Waxes (Microcrystalline).

The order of listing has no bearing on quality, or strength of adhesive, but is convenient for the order in which stationers adhesives are dealt with below.

Traditional stationery adhesives are to be found in (1), *i.e.*, gum mucilage; and (2) whitish translucent mucilages and semi-solid pastes. Since these are probably best known by their physical form they will be described as such, *i.e.*, fluid adhesives and semi-solid pastes.

Adhesives in categories (3) (4) and (5) are not truly stationery adhesives, but they may be included in the modern stationers stock.

Those adhesives in the remaining categories are unlikely to be sold by the stationers and are not therefore dealt with.

It should be noted that many adhesives are sold under proprietary names either for general purpose or specific use. Different types of containers are used in a variety of sizes. Where instructions are given for usage, these should be carefully followed. Additionally, special precautions may be necessary or desirable, for handling or storing certain types of adhesive.

Bonding

In general, if one wishes to form an adhesive bond between two surfaces, it is essential to have some adhesive on the surfaces concerned. The presence of a large amount of adhesive does not in itself ensure a strong bond. An adhesive that is hard and brittle when dry will not give a good bond if there is a thick film between the two surfaces. If a surface is absorbent and the adhesive can sink in, sufficient may not remain on the surface, where it is required, to make an effective bond. The choice of the correct adhesive for use with a given paper or board may depend, then, not only upon personal preference but also upon the ability of the adhesive to remain, unabsorbed, on the surface of the material. Only experience can furnish the answers.

Adhesion of Plastics

Plastic materials are of many and diverse types and most are difficult to bond satisfactorily either to one another or to other materials. Some, notably polythene and polypropylene, are impossible to adhere by normal methods. Rigid materials, *e.g.*, laminates such as formica may be bonded to other surfaces by many thermoplastic adhesives, especially those termed "impact" adhesives, sufficiently for many purposes; superior but expensive bonding may be obtained with thermosetting adhesives. Soft plastics pose difficult problems and where they are available, specially designed adhesives should be used. Adhesives for repairing plastic (PVC) rainwear or polystyrene articles consist of volatile solvents that can soften the plastic surfaces —(and damage them if used in excess)—and contain some dissolved resin to control their flow. Beyond these special cases it is hazardous to recommend adhesives for use with plastic materials unless the advice is supported by known practical experience.

Fluid Adhesives

The best of these is usually described as "gum mucilage" and it is made by dissolving gum arabic (gum acacia) in water, adding chemicals to prevent deterioration, maturing the solution, and separating off sediment by filtration or other means. Other chemicals can improve the resistance of the dried adhesive to water, but some gum mucilages may be used as re-moistenable adhesives—*e.g.*, for the flaps of envelopes. Mucilages made from gum arabic have a yellow-brown colour and may be either clear or slightly cloudy; cloudiness gives an unattractive appearance but does not adversely affect the adhesive power.

Whitish translucent mucilages, sometimes called "fluid pastes," are made from starch derived from tapioca or, most usually, potato (farina starch), by heating in the presence of strong chemicals. These latter remain in the finished product and may cause discoloration of tinted papers and certain coloured printing inks. Their adhesive power is less than that of gum mucilage made from gum arabic, but they are often preferred for their cleanness in use and (in the absence of the above effects) their lighter colour.

Semi-solid Pastes

White semi-solid pastes are made from a special grade of dextrine, prepared by the carefully controlled acid and/or oxidizing treatment of starches. The dextrine, insoluble in cold water, is dissolved in hot water and the solution is slowly cooled and matured; it sets to an easily-worked white paste that may be spread with a brush or spatula. Such an adhesive is very clean to use, it dries quickly and does not cause the paper to curl or cockle (as the other adhesives often do) during or after drying. The dried adhesive may readily be

1. Gum Mucilage.
2. Semi-Solid Paste.
3. Fluid Paste.

reactivated by moistening, a fact that is important when an area greater than, say, six square inches has to be covered at one time. White dextrine adhesives do not cause discoloration of papers or inks. A popular use for adhesives of this class is in photographic mounting. Provided that they are properly used as the makers direct, they are well suited to this use, but their use on colour photographs is not to be recommended.

Glues

Glues, which may or may not require heating before use, are usually sold in tins or collapsible tubes. They are made from gelatine products derived from fish or animal sources and tend to have an unattractive odour. Glues are needed in rendering adhesive only the heaviest weights of card or board and have no advantage with paper or light card.

Rubber-based Adhesives

Adhesives of this class dry quickly to give strong bonds that have the great virtue of flexibility; they are of two types:—

Solutions: A solution of rubber in a volatile solvent provides an alternative to a mucilage or paste adhesive, drying more quickly and with much less effect on the surfaces to be bonded. These attributes make such an adhesive very suited to use with papers or the like, that are to be repeatedly handled after bonding, and to use in photographic mounting. Disadvantages are flammability, marked odour during use, and readiness to dry out if not kept sealed whilst not in use.

Latexes: Rubber latexes, chemically treated to secure rapid drying and developments of strong "grab" (adhesion quality before drying) are used to join or repair carpets or textile fabrics.

Synthetic Resin Adhesives

There are two main types: thermoplastic and thermosetting. Bonds made with the former may repeatedly be loosened (softened) by application of heat, whereas those produced by the latter are developed by heat and not softened.

Thermoplastic Adhesives: These are of two broad types: (i) those based on chemical derivatives of cellulose and, therefore, semi-synthetic, and (ii) those based on fully synthetic resins. All cellulosic and most fully synthetic adhesives consist of solutions of the resin, with or without additives, in volatile solvents, bonds being formed as the solvent evaporates. In general they are not suitable for use with paper or card and even where they are usable they are wasteful, as they are much stronger than they need to be for this purpose. Some fully synthetic adhesives consist of emulsions (latexes) of the resin, notably PVA (polyvinyl acetate) which dry by loss of water. Thermoplastic adhesives are suited to the adhesion of a wide range of materials, usually indicated by the manufacturer, and give bonds of good strength. PVA emulsions are now widely used in woodworking, as an alternative to conventional glues. Solution-type adhesives are usually sold in collapsible metal tubes, from which the solvent very slowly diffuses even before they are opened for use; they have thus a limited shelf-life and should not be allowed to remain too long in stock. Most emulsions require protection from hard frost, which can destroy them.

Thermosetting Adhesives: These consist of two fluid or semi-fluid components, separately packaged, which must be mixed shortly before use; once the adhesive is mixed its useful life is quite short. Most materials, no matter how heavy, may be joined, and bonds are formed slowly at room temperature but more rapidly at higher temperatures. Once formed they are unaffected by heat or moisture (the latter often adversely affects thermoplastic bonds). They are comparatively expensive but are unrivalled where heavy-duty bonding is called for.

Twines and Cords

More generally known as "string," these materials are made from various plant fibres, each of which has its own individual characteristics in colour, strength and finish. For the majority of general uses, any of the fibres will produce a sufficiently strong twine or cord.

The names listed are also the names of the plants from which the fibres are obtained, and they are detailed to give an approximate idea of order of strength.

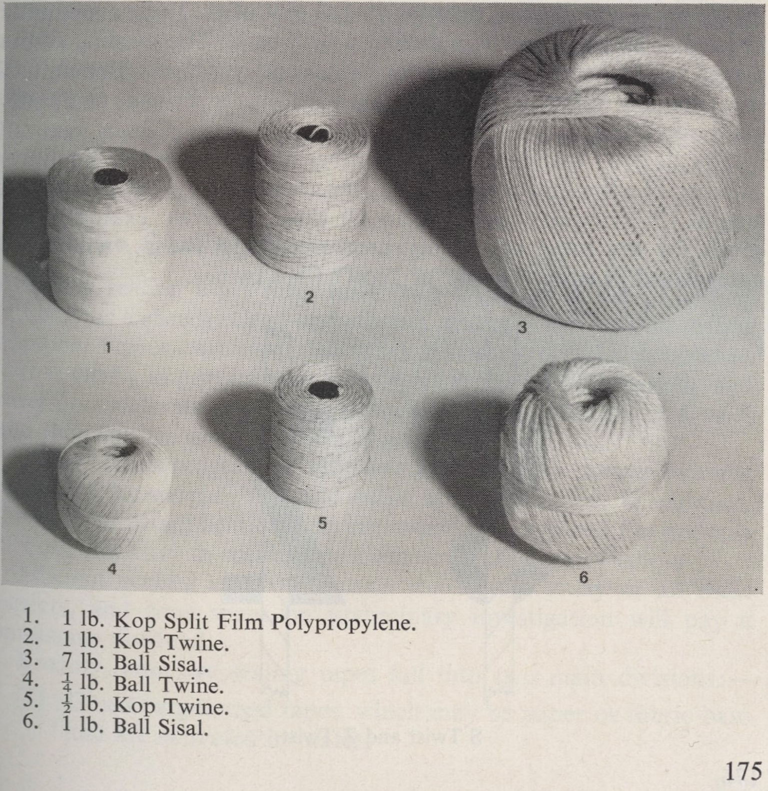
Cotton: Made from fibre extracted from the cotton plant, off-white in colour.

Flax: A soft fine fibre extracted from the stem of the flax plant from France, Belgium, The Netherlands and Russia; the colour can be dark grey, bluish green, brown or creamy white.

Hemp: This term covers a variety of soft fibres extracted from the stem of hemp plants, cultivated in Europe, India, North and South America. Colour varies from dark or steel grey to creamy white.

Jute: This also is a soft fibre extracted from the stem of the plant, which is cultivated in India and Pakistan. Colour varies from light brown to deep cream or slate grey.

Sisal: A fibre of firm texture derived from the plant leaves of the agave species, cultivated principally in East Africa. The colour is creamy white or white.



1. 1 lb. Kop Split Film Polypropylene.
2. 1 lb. Kop Twine.
3. 7 lb. Ball Sisal.
4. $\frac{1}{4}$ lb. Ball Twine.
5. $\frac{1}{2}$ lb. Kop Twine.
6. 1 lb. Ball Sisal.

At this point mention must also be made of another material:

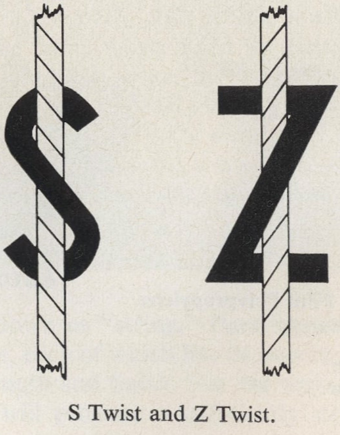
Split Film Polypropylene: This is a plastic material produced from the breakdown of crude oil into its various forms. It can be made into twine and possesses the considerable advantage of a very high breaking strength. It is also very light in weight, therefore giving longer length per lb. than any natural fibre twine. Additionally, it is rot-proof and can be stored in the open.

Twines and cords are usually sold by weight and made up into "balls," "kops," or "cheeses," ½ lb. or 1 lb. being the most popular weight so far as the stationery trade is concerned. They may also be made up to sell at a specific price rather than weight. The breaking strength and length per pound weight will vary according to quality and manufacture—*i.e.*, a cord made from a fibre of low strength would need to be thicker, and therefore yield less length per lb. for a given breaking strength, than one made from a fibre of higher strength.

Descriptions and Measurement

Cordage for parcelling purposes can be single ply (or single yarn) which is usually twisted in a clockwise direction, or Z twist; or, the single ply can be twisted together in 2, 3 or 4 plies. These are usually twisted in an anti-clockwise direction or S twist. The twisting of the single yarns together gives various sizes and yardages. The unit of measurement called a "lea" or 1 lea yarn, has a runnage of 300 yd. per pound weight.

The description and pattern number varies according to fibre, number of plies and runnage, *i.e.*, the number of yards per pound weight. It is impossible to detail all these, but two examples are given for the most commonly used parcelling twines, which are categorized as either "hard" or "soft" fibre twines.



S Twist and Z Twist.

Hard Fibre: The most widely used fibre is Sisal, which has a hard feel to the hands. The various sizes are usually described by giving the number of plies and the yardage; *i.e.*, 3/100's, 4/75's, 3/75's. The first figure is the number of plies and the second the yards per pound weight. For example, 3/100 denotes the twine has 3 plies and has a runnage of 100 yd. to the pound. The yardage is arrived at by dividing the 1 lea runnage (300 yd. per pound) by the number of plies.

Soft Fibre: These are mostly made from Hemp or Jute and are softer to the hands than hard fibres, but not quite so strong on a size for size basis, and are dearer to buy. These are often labelled 202, 302, 301, 401, 401½, etc. The first figure indicates the number of plies or single yarn in the twine and the last figure the lea or yarn size. The "0" is ignored.

To obtain the yardage, a 202 twine calculation is as follows. The first figure indicates 2 ply and the last indicates the yarn size is 2 lea. As 1 lea yarn is 300 yd. per pound, 2 lea yarn is 600. This is then divided by the number of plies (2 in the example); the yardage then becomes 300 yd. However, as soft fibre twines have to be twisted firmly, a contraction takes place and an allowance of 10 per cent. is made. The finished yardage of a 202 twine then becomes 270 yd.

In selecting a twine or cord, consideration must be given to its use—*i.e.*, for retail counter sales, for goods dispatched by post, rail, road, or sea—and to whether the goods are likely to be stored in the open and subject to weather conditions. For special purposes, or for use when sending to foreign climates, rot-proofing may be necessary. There are a number of British Standards covering natural and man made fibre twines and cords for packaging purposes.

Adhesive Sealing Tapes

Adhesive sealing tapes have long been accepted in the packaging industry as a speedy, clean and efficient means of closing and sealing fibreboard cases, cartons and all types of kraft-wrapped merchandise.

It is vitally important that the correct type of tape is chosen, and careful consideration must be given to the requirements of a pack and the transit hazards that are involved.

The width, strength and adhesive grip must be assessed having regard to the weight, bulk and value of the pack and, in addition, the method of application warrants careful thought on the grounds of both efficiency in sealing and economy in the use of labour.

Efficient sealing must necessitate the careful study of all these aspects, and time spent on preliminary investigation will pay a handsome dividend.

Broadly, adhesive sealing tapes fall into two main divisions:—

(1) Glued or gummed tapes, which may be paper or fabric base and are activated by water;

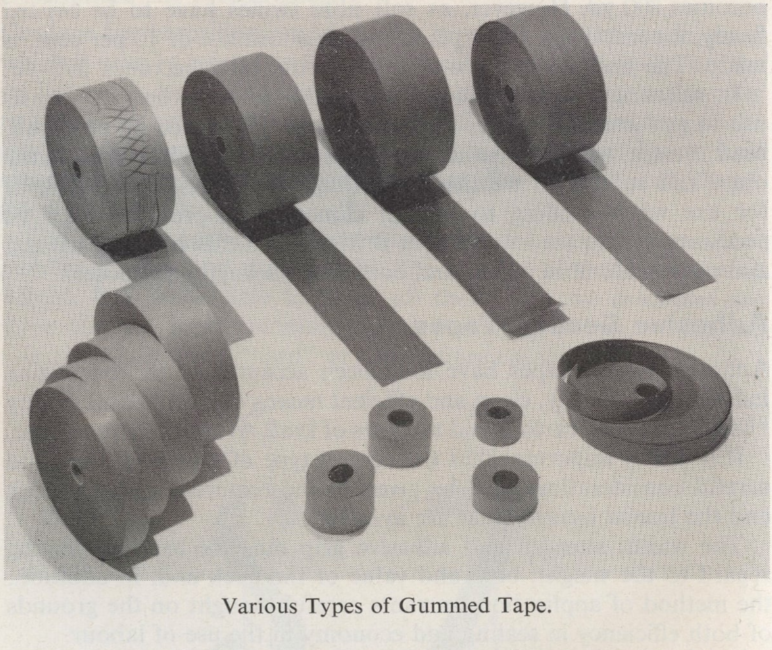
(2) Pressure-sensitive or self-adhesive tapes, paper, fabric or plastic base, the coating of which is already activated ready for direct application.

In considering these two divisions it is advisable that initially each is dealt with individually. Then other considerations will be dealt with that are more or less common to both.

Glued or Gummed Tapes

Adhesive Compatibility: Gummed tapes will adhere satisfactorily to all packs or containers made from paper or fibreboard, but cannot be considered satisfactory on metals or plastics. Becoming, as they do, an integral part of the pack, they provide suitable reinforcement, as is evident by the protection of mitred corners for the traditional "H" method of sealing the carton.

Tapes based on hard sized kraft will provide reasonable moisture-resistant and water-resistant properties which are adequate to cover normal transit hazards.



Various Types of Gummed Tape.

Base Materials: Base papers generally consist of a pure hard sized kraft to resist adhesive penetration during coating and to provide flexibility in use. Bursting strength would range from 30 lb./sq. in. on low-weight tapes to 70 lb./sq. in. for heavy baling tapes.

When exceptional strength is required, heavy-weight duplex glass-fibre reinforced laminated base papers are available which, by the arrangement of their fibre strands, may be resistant to such a degree that they are impossible to tear or rupture.

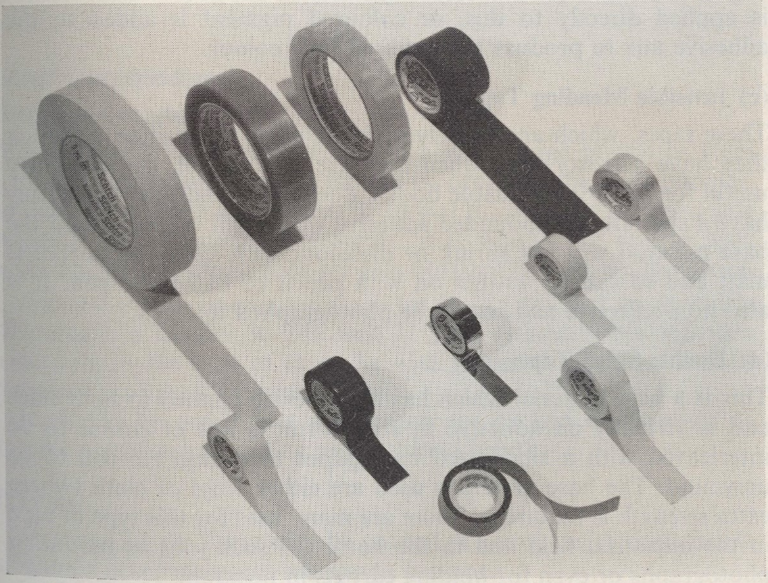
Fabric and cloth glued tapes are available for specialized uses, mostly of a reinforcing nature.

Although adhesive coatings have for many years consisted of pure animal glue, recent developments indicate considerable activity towards the perfection of non-protein and synthetic adhesives.

Pressure-Sensitive Tapes

Adhesive Compatibility: Pressure-sensitive or self-adhesive tapes will adhere to all paper and board packages or containers and also to more difficult surfaces such as metal, plastics, waxed board, etc. These tapes need only the application of pressure to make them adhere satisfactorily to almost any surface which is free from dust, oil, grease or moisture.

Base Materials: Pressure-sensitive tapes cover a very wide range of base materials. The most generally used is untreated viscose cellulose film in either transparent or coloured form. This type is not water-proof but is resistant to oil and grease and to most solvents.



Various Types of Pressure Sensitive Tapes.

Acetate polyvinyl chloride cloth and paper are also in common use, and a particularly strong form of tape is available carrying reinforcement with rayon or nylon filaments which give an extremely high tensile strength.

The adhesive is compounded mainly from rubber and resin, which, when dissolved in a solvent, produces a workable coating solution. The degree of adhesive property may be varied according to the formulation, thus providing a range of adhesive properties.

Perhaps the most remarkable feature about any tape is the fact that when the tape is unwound the adhesive stays on the correct side and does not come "unstuck" on the outside surface of the subsequent layer. This is achieved by applying a "key" coat made of casein and adhesive to the base film, before the main adhesive coating is applied. The key coat remains firmly anchored to the film and the adhesive remains firmly anchored to the key coat.

(a) Transparent Cellulose Tape

This is the most widely used of the pressure-sensitive tapes and is suitable for all general applications. Although it is the backbone of the industry, it is only one of many specialized tapes available.

(b) Coloured Cellulose

The various coloured tapes that can be obtained can be produced in one of two ways. Either the base material is coloured and the adhesive is applied directly to this, or coloured pigment is added to the adhesive mix to produce the required final colour.

(c) Invisible Mending Tapes

These tapes, which are entirely invisible when in position although they have a frosty look when they are on the roll, are extremely useful for repairing valuable books, documents and drawings. They have a specially compounded adhesive which will not ooze, and the base material will not shrink or discolour with age. The surface is matt and so can be written on with pencil or ball-point pen. It is also non-reflective and so can be photographed through.

(d) Double-Sided Tape

This is a base material which has an adhesive applied to both sides and is virtually an adhesive in strip form; it has of course to be interleaved with a siliconized base paper to enable the roll to be unwound. The base materials used are either vinyl or cloth (where extra strength is required). There are many uses for this type of tape in the industrial field and in the home for such jobs as mounting photographs or even for holding carpets in position.

(e) Cloth Tapes

Tapes of this nature, some of which are waterproof, are also generally available, and are used for the sealing of heavy packages. Cloth tape can also be produced with a plastic coating. Usually made from brightly coloured cloth, this tape is waterproof and so can be used both indoors and outdoors. It can also be used for repair work such as car upholstery repair, and is also invaluable in the home as a decorative medium.

(f) Reinforced Banding Tape or Filament Tape

This is one of the strongest tapes produced. It has a very strong base material to which is laminated a series of very tough strands of nylon. This is then overlaid with a coating of adhesive, making it completely waterproof. The main use for this type of tape is on heavy packaging jobs, but it has also been used for such jobs as bundling steel bars. Its advantages are that it will not damage the contents of a package and that it is virtually as strong as steel straps.

(g) Masking Tape

This is a strong general purpose creped paper, specially treated. As the name implies, it is widely used for masking areas when spraying or painting cars, window frames, etc. It will also resist temperatures and is, therefore, suitable for masking articles during stove enamelling. Manufacturers literature usually details maximum temperatures. It is also used extensively in drawing offices and has numerous other applications.

Other Considerations

Sizes and Lengths

Most *gummed tapes* are available in a wide range of widths from $\frac{1}{2}$ in. to 12 in. or more, with 1 in. to 3 in. probably the most popular. In length the range is from 500 ft. to 800 ft., with the gummed side wound inside. Sometimes, however, it is wound the reverse way, according to use. Small rolls are also obtainable made up to a price.

Pressure-sensitive tapes are available from $\frac{1}{4}$ in. to 3 in. in width. The length is usually 36 yds. and 72 yds., although this will vary according to the type of tape. As with gummed tapes, small rolls are made up to sell at specific prices.

It should be noted that most tapes are packed or cartoned to specific quantities according to width and length.

Printing

Gummed Tapes: These may be printed in colours with trade mark, slogan or other messages relative to contents.

The British Post Office will accept for registration parcels sealed with gummed tape alone provided that such tape bears the name or distinguishing mark of the sender. The Railway Clearing House of the British Transport Commission will accept fibreboard cases at the carrier's risk when they are tape-sealed in accordance with its specification.

Pressure-sensitive Tapes: These also may be printed to special requirements. Being used mainly by manufacturers for packing, in this way they advertise their products while in transit. Again, the British Post Office will accept for registration parcels sealed with adhesive tape alone, provided the tape is fully printed with the sender's name or trademark.

In advertising, printed tape carrying the manufacturer's name and message is used as shelf-edging.

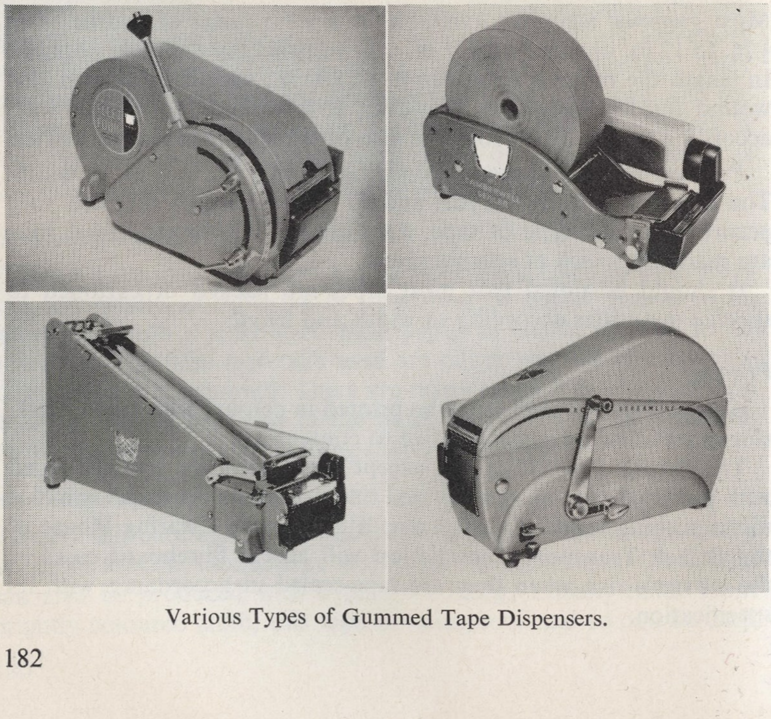
Many shops and stores use printed tape to seal parcels and to identify and price-mark their stock.

After printing, tapes can then be laminated to make them waterproof and to give a long life. Where there is an extremely long run, under-surface printing can be used; this gives an extremely bright finish, and, as the adhesive is put on after the tape has been printed, the print is completely protected and cannot be scratched off.

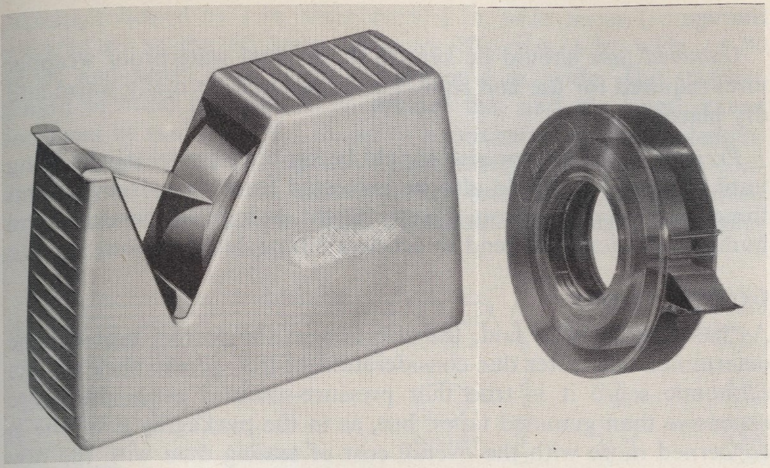
The bright and very attractive Christmas tapes now available are mainly produced by this under-surface process, and it is this that gives them their sparkling finish.

Dispenser Units

The efficient application of tape depends largely on the type of dispenser being used according to the sealing being carried out.

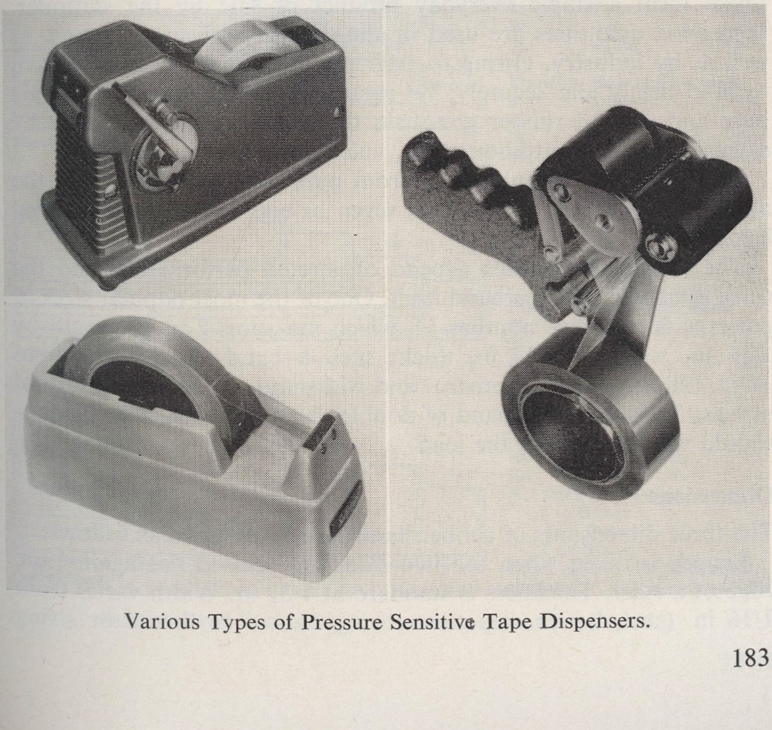


Various Types of Gummed Tape Dispensers.



Hand Type, Pressure Sensitive Tape Dispensers.

A wide range for most tapes is available, from small hand applicators to desk or counter units and semi-automatic or fully-automatic machines that will cut off one or more pre-set lengths of tape ready for immediate application. Some types are made for special purpose use, such as carton, box and bag sealing.



Various Types of Pressure Sensitive Tape Dispensers.

Storage

Gummed tape should be kept in its original waterproof wrapper until required for use and should be stored in a normally warm and dry place.

Pressure-sensitive tape also should be kept in its original wrapping until required. It should also be protected from dust, from solvent fumes, and especially from direct sunlight, as high temperatures and humid conditions will tend to accelerate tape deterioration.

General Summary

As has already been said, the selection of the correct tape can be determined only after due consideration of the specific pack. In the economic sense it is true that pressure-sensitive tapes are more expensive than gummed tapes, but, as in the packaging field one is concerned more with the overall cost of sealing than with the raw material cost, it is necessary to take into account factors such as labour and productivity.

British Standards are published on closing and sealing tapes, and deal with the materials, application and use, storage, methods of testing, etc.

Rubber Bands

These form a staple everyday product of sale by the stationer. Increasing quantities are used in almost every office and home, as well as by industry. Owing to their required functions—to stretch, to hold firmly and securely, yet return to their original size—only pure and natural rubber goes into the process of manufacture by extrusion into a continuous tube, vulcanizing and cutting.

Rubber bands manufactured from pure natural rubber have the ability to stretch by as much as seven or eight times their original length.

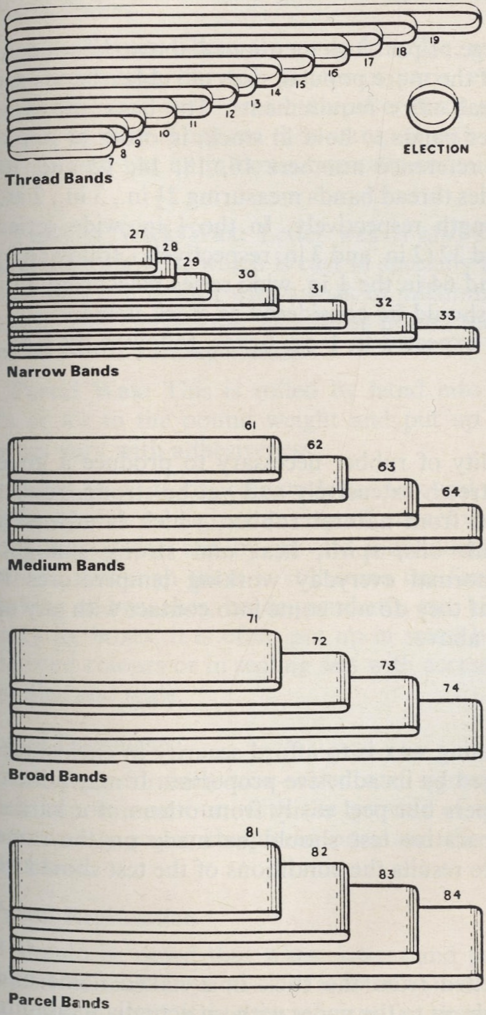
The holding properties depend on stretch performance and the three dimensions of the band itself. One of the most popular sizes of patterns is reference number 14, which measures 2 in. in length by 1/16 in. wide by 1/32 in. thick; such a band should stretch to 14 in. (28 in. in circumference) and withstand a load or pressure of at least 7 lb. A rubber band of double the width—*i.e.*, $\frac{1}{8}$ in. wide—should withstand twice the load.

Dimensions

The three dimensions of rubber bands are determined as follows.

Length is taken when the two sides are pressed flat against the edge of a ruler. Thickness is standard at 1/32 in. Width varies from 1/16 in. (such bands sometimes being known as thread or string bands), followed by ⅛ in. wide series, ¼ in. wide series (sometimes referred to as the 60 series), ⅜ in. or 70 series, ½ in. wide or 80 series and heavy duty series, measuring ⅝ in. wide. The smallest length of band measures ½ in. pressed flat, and the length range increases by multiples of ¼ in. up to a maximum of 9 in. in length.

The range of sizes (lengths) of rubber bands has increased considerably in recent years, and very often better service can be given to a customer by obtaining from the manufacturer sizes of samples suitable for specific uses.


19
18
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ELECTION
Thread Bands
27
28
29
30
31
32
33
Narrow Bands
61
62
63
64
Medium Bands
71
72
73
74
Broad Bands
81
82
83
84
Parcel Bands

No	Length	Approx. No. in a pound
Thread Bands 1/16 in wide		
6	Election	11,000
7	¾ in	9,000
8	7/8 in	8,000
9	1 in.	7,250
10	1¼ in.	5,400
11	1½ in	4,500
12	1⅝ in.	4,250
13	1¾ in.	4,000
14	2 in.	3,450
15	2¼ in.	3,000
16	2½ in.	2,750
17	2¾ in.	2,500
18	3 in.	2,300
19	3½ in.	2,000
Narrow Bands 1/8 in. wide		
27	1¼ in.	2,700
28	1⅜ in.	2,300
29	1½ in.	2,000
30	2 in.	1,650
31	2½ in.	1,350
32	3 in.	1,150
33	3½ in.	1,000
Medium Bands ¼ in. wide		
61	2 in.	850
62	2½ in.	675
63	3 in.	600
64	3½ in.	480
Broad Bands ⅜ in. wide		
71	2 in.	570
72	2½ in.	450
73	3 in.	395
74	3½ in.	330
Parcel Bands ½ in. wide		
81	2 in.	425
82	2½ in.	350
83	3 in.	325
84	3½ in.	250
Parcel Bands ⅝ in. wide		
104½	4½ in 1/32 in.	145
105	5 in. 1/16 in.	95
106	6 in. 1/16 in.	75

A.. sizes stocked in
1 lb Boxes
4 oz. Boxes
2 oz Boxes
either all one size to a box or assorted.

Rubber Band Sizes with Approximate Count per Pound.

Colours

The standard colour of rubber bands is a translucent shade of brown. Nowadays, in addition, a wide range of many sizes is available in red, blue, green and yellow.

Units of Sale and Recommended Stocks

The most modern method of sale is by weight in boxes with contents ranging from ½ oz. through 1 oz., 2 oz., 4 oz. to 1 lb. Other exceptionally popular forms of pack are cellophane film bags of assorted sizes, which have the advantage of being easy to display and are attractive quick sellers.

In addition to the range of packings mentioned above, boxes containing an assortment of the more popular sizes of rubber bands are recommended for general office requirements. The basic range of individual sizes of rubber bands to hold in stock, in order of popularity, comprises stock reference numbers 16, 18, 14, 12 and 10, which are all 1/16 in. series thread bands measuring 2½ in., 3 in., 2 in., 1⅝ in. and 1¼ in. in length respectively. In the ⅛ in. wide series, reference numbers 30 and 32 (2 in. and 3 in. respectively), followed by reference numbers 63 and 64 in the ¼ in. wide series measuring 3 in. and 3½ in. respectively, should be considered as stock items.

The main sale can be expected in 1 oz. boxes, followed by ½ oz., 4 oz., 2 oz. and 1 lb.

Storage Conditions

Owing to the high quality of rubber necessary to produce a good rubber band that will stretch extensively and yet be strong, rubber bands are manufactured from natural rubber, which is adversely affected by contact with oils, spirit, heat and strong sunlight. Storage of stocks in normal everyday working temperatures is satisfactory provided that they do not come into contact with any of the elements mentioned above.

Sealing Wax

The chief purpose of sealing wax is to afford security to enclosures.

A wax should be judged by its adhesive properties. It may adhere quite well to certain papers but peel easily from others of a harder nature. A strictly comparative test should be made on the same sheet, and to get accurate results the conditions of the test should be as similar as possible.

Method of Testing

The wax should be melted from the stick in a naked flame and dropped as hot as possible on to the paper without actually scorching the surface. The seal should be stirred round rapidly with the stick of wax until it is of reasonable thickness. It should then be allowed to become absolutely dead cold, after which the seal should be carefully worked off by easing the paper away from it, working gradually inwards from the edge of the seal. The amount of tear left by respective seals indicates the comparative adhesiveness and may vary from barely disturbed paper fibres to a hole in the paper almost as large as the seal itself.

The quality of the paper should be adjusted to the nature of the wax being tested.

Postal Waxes

Letter Waxes: These are made from lac, resin and mineral bodies such as whiting, barytes, plaster of paris, etc., and are cast in the form of square sticks which are afterwards polished by melting the surface by heat. They are then stamped with quality mark or special imprint and put up in boxes normally containing 1 lb. net weight of wax.

Taper or Wick Wax: Letter wax is also supplied in the form of taper or wick wax, which is cast in specially adapted moulds so that each stick can be cast with a wick of inflammable material down the centre. This enables the wick to be lit and the wax to be melted like the wax of a burning candle.

Parcel Wax: This is rolled by hand into round sticks generally 8's or 4's to the pound weight and put up in 1 lb. paper parcels. Prices vary with adhesiveness.

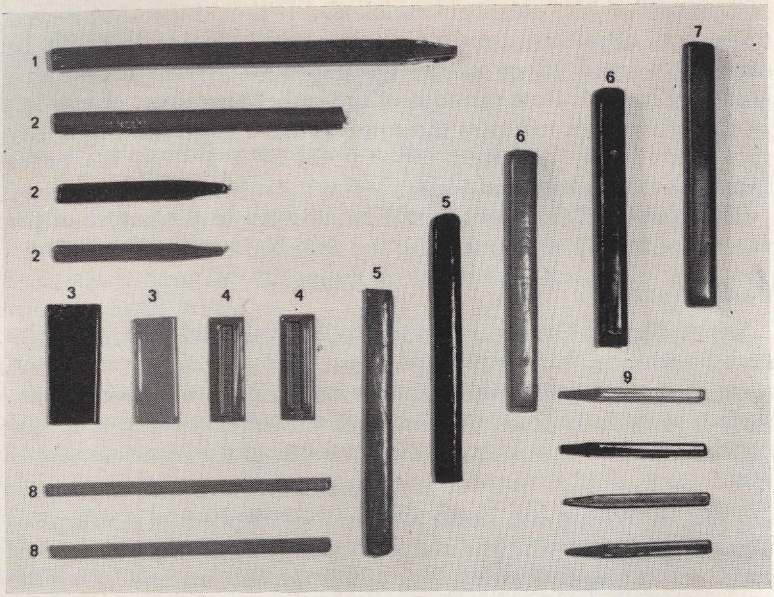
Fancy Wax: Both ordinary letter wax and taper wax are produced as fancy wax in a great variety of attractive colours. Fancy wax is sold mostly for use by private individuals for sealing letters or parcels, although there is still some use for it in craft work in the making of brooches, beads, pendants, etc. Usually available in 1 lb. or 1½ lb. boxes, it is often put up in small boxes of 3 or 4 sticks of assorted colours or in sealing sets with accessories such as miniature candles and seals.

Legal Documents

These were formerly wax-sealed and signed, the seal being of the first importance, but, with the growth of education, the seals are now mostly paper chequered ones and the stress is laid upon the signature.

Postal Registration

It should be noted that where letters and parcels are to be sent by registered mail they must be fastened with sealing wax, gum or other adhesive matter; it is not sufficient for them merely to be tied with string. Whatever method of fastening or sealing is adopted, it is



Sealing Waxes.

1. Letter Wax.
2. Taper Wax.
3. Engravers Plate Wax.
4. Sealing Machine Wax.
5. Bottle Wax.
6. Parcel Wax.
7. Gas Meter Wax.
8. Engravers Wax.
9. Fancy Waxes.

essential that it should not be possible to remove any part of the contents of the letter or parcel without either breaking or tearing the case, wrappers or covers, forcing two adhesive surfaces apart or breaking seals.

Postal Insurance

Insurance in the imperial and foreign service of the Post Office is the equivalent of registration in the inland service. All seals on an insured letter, box or parcel must be of the same kind of fine wax (or lead or steel in the case of parcels), and must bear distinct impressions of the same private device. A coin may not be used for sealing, and the device may not consist merely of straight, crossed or curved lines which could readily be imitated.

Other Special Waxes

Bottle Wax: This is similarly shaped by hand into square rough sticks usually 4's or 2's to the pound weight and put up in 7 lb. paper packets. For export it is not unusual to supply in 1 lb. slabs.

Bottle wax should be glass-adhesive and is used to seal bottles of wine hermetically so that the wine may mature without contact with the atmosphere.

The bottles are corked and the necks of the bottles are usually dipped into a ladle of the molten wax. Care should be taken that the wax does not become over-heated and that it is kept stirred when molten. It should not be allowed to set in the ladle after use, but should be tipped out on to a slab to cool. When required again it can be broken up and re-melted. Complaints about bottle wax not working properly may be due to inattention to the above details or to traces of moisture, either in the cork or on the neck of the bottle, at the time of sealing.

Engravers Wax: is a very high-quality wax used by numismatists for taking impressions of coins or medals and is largely used by museums.

Engravers Plate Wax: is used for filling in the letters engraved in certain types of name plates, plaques, etc.; usually to give a contrasting colour between the letters and the metal of the plaque itself.

Gas Meter Wax: is a form of bottle wax and is used for sealing certain parts of gas meters after testing.

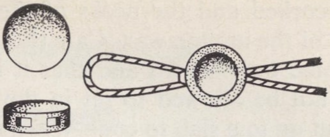
Sealing Machine Waxes: These are usually supplied in small tablets approximately 3 in. × 1 in. or $1\frac{3}{4}$ in. × $\frac{1}{2}$ in. for use by banks and large offices in electric sealing machines. Their special property is that they should flow easily as the heat is applied by the apparatus. Occasional complaints are usually due to the fact that the wax has been allowed to cool in the melting chamber of the device; this, if repeated too often, has the effect of clogging the outflow. All such devices should have the surplus wax run off on to a cold slab after use. It can then be broken up when cool and re-used without danger of clogging.

Parcel Seals

These are used for securing all classes of merchandise against pilfering during transit, by fastening the ends of the string to the seal. One type made from lead, is used by passing the ends of the string through an opening in the seal and then clenching in closing pliers. The dies in the pliers can be engraved with name, initials, etc., to leave an impression on the closed seal.

They can also be made from steel. In this case the ends of the string are placed in between the two parts of the seal, which is then clenched with closing pliers. Where name or initials are required, the seals can be engraved for minimum quantities.

Various sizes of seal are available together with pliers to suit. Some transporters demand the use of seals on certain classes of goods.



Parcel Seals.

Metal Stencils

Metal stencils are mainly produced from zinc, but can also be supplied in brass and copper. They are used for the marking of packing-cases, cartons and sacks, and are supplied in sets of letters and/or figures, either as individual plates or interlocking to enable special words or codes to be made up. Where the same marking is required on quantities of packages, the complete stencil, bearing all the details required, can be obtained in plate form. Plate stencils may also be obtained in plastic, which facilitates the marking of curved surfaces without risk of the stencil breaking.

Brushes made from a special bristle are necessary for use with stencils because of the heavy use to which they are subjected.

Stencil ink, in various colours, is available in cake form, in tins, or in liquid form. For use on packing cases or where a degree of permanent marking is required, a waterproof or spirit stencil ink should be used.

Weighing Machines

While there is a wide range of machines available for all purposes, this section will cover only those suitable for the home user and for normal office and mailing room requirements, where the principal need is to ascertain postal charges for letters and parcels.

Spring Balance

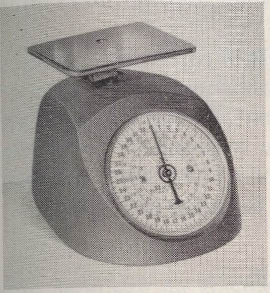
This is the most popular type, and incorporates a self-indicating dial, which allows the user to read the weight and the rate chart simultaneously. Spring balances may be divided as follows:—

Letter Balances: Made either with a durable plastic body or of all metal, these have a clear white dial with coloured weight and rate markings. They are made in a variety of capacities to suit individual needs. The most popular are:—

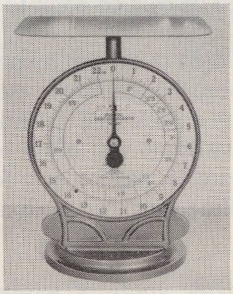
(*a*) To weigh up to 8 oz. with graduations of $\frac{1}{4}$ oz.
(*b*) ,, ,, 16 oz. ,, ,, $\frac{1}{8}$,,
(*c*) ,, ,, 32 oz. ,, ,, $\frac{1}{4}$,,
(*d*) ,, ,, 5 lb. ,, ,, $\frac{1}{2}$,,

The balances generally are fitted with a flat-top goods plate, but certain models are obtainable with a curved plate for weighing rolled packages. Most models also have a zero adjusting screw.

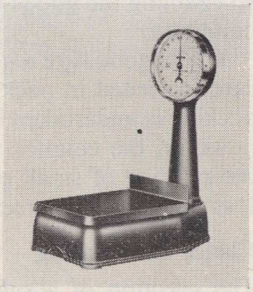
Parcel Balances: These also are available with a plastic body, but most are really sturdy all-metal machines, to stand up to rough usage in view of the heavier weights. The 5 lb. balance mentioned above would be suitable for small parcels, but the more usual capacity is 22 lb. with 2 oz. sub-divisions. They are normally fitted with a flat-top goods plate.



Letter Balance.



Parcel Balance.



Heavy Duty
Parcel Balance.

For the user with a need to weigh really large quantities of parcels, scales of the type used in post offices can be obtained. These models are of very much heavier construction, with glass-covered dials and dashpots for quick reading. The latter is a plunger device which is designed to speed up weighing by reducing indicator oscillation to a minimum, without interfering with the sensitivity or accuracy of the machine. Models in this category, however, are usually obtained only to special order.

It should be mentioned here that manufacturers have their own standards of accuracy, which will vary according to price and quality of the model. Some of the more expensive machines, however, can be stamped by the Weights and Measures authorities to confirm that the scale complies with their requirements of accuracy and construction.

Beam Scale

This is another type of balance, but generally not so widely used as the spring balance; it works on the fulcrum principle. The goods plate is fitted one side, and the weight plate on the other. The weight is ascertained by placing various brass weights on the one side to counterbalance the article on the other side. With this type of balance there is the need to calculate weight and to refer to cost in order to arrive at the postal charge. In consequence they are considerably slower to use.

Parcelling

In addition to selling materials required for packaging and wrapping, the assistant will undoubtedly be required to pack parcels. For the counter wrapping of merchandise, materials such as wrapping paper, counter bags and carriers, twines, tapes, etc., are provided. Even so, care is required to ensure that goods are wrapped tidily and securely. This should be regarded as part of the service to a customer, so enabling the goods to be carried back to their destination in mint condition.

Where goods are required to be sent by post or carrier even greater care is needed in packing. In the larger establishments this type of packing is undertaken by a packing department. In smaller concerns, however, the counter assistant will often be required to undertake the packing of small parcels, particularly for transmission by post. It is this class of parcelling that this section is concerned with.

Choice of Wrapping

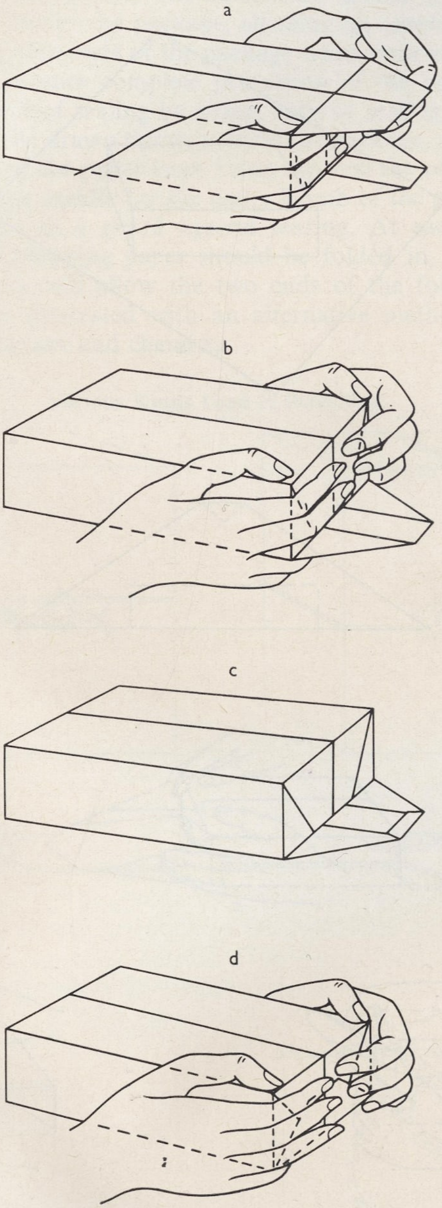
The selection of a suitable grade of wrapping is an essential prerequisite for successful parcelling. It is impossible to detail the correct grade and substance for every type of goods, but generally Kraft paper, either pure or imitation is most often used. The number of sheets will depend upon the substance of the wrapping and weight of the parcel. Again it may be advisable to include a sheet of corrugated paper. It must not be assumed that the heaviest substance or best quality wrapping is the best. In certain cases a thinner paper may be superior in bursting strength. Again a thick paper of a lower grade may be adequate in some circumstances. Some goods may require an inner wrapping, of tissue, whilst others may need additional cushioning to prevent damage.

Parcelling

One of the British Standards published on packaging, covers paper and board wrappers, etc. The following extract and diagrams serve good purpose in detailing the considerations that should be given to parcelling.

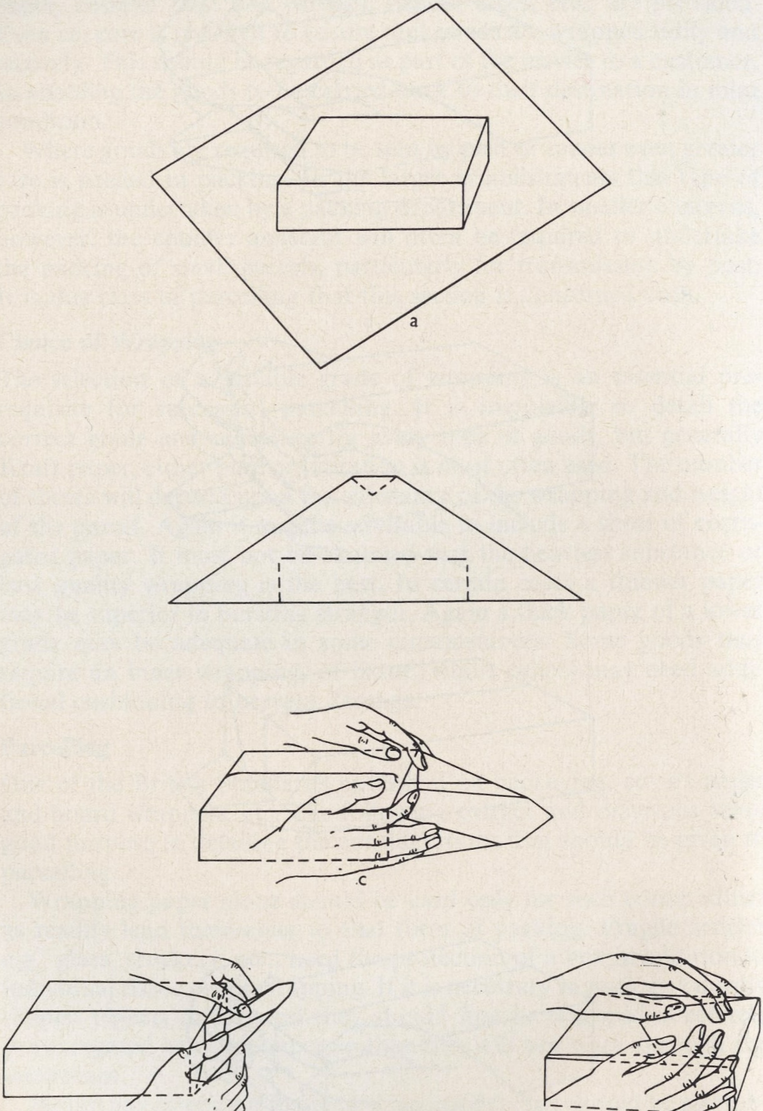
Wrapping paper alone should be used only for such commodities as readily lend themselves to that form of packing. Fragile articles *e.g.*, glass, crockery, etc., need the protection of a box in addition to individual tissue paper wrapping. If it is necessary to pack awkwardly shaped objects in a parcel they should first be wrapped effectively in corrugated or other paper so that they will not work through the wrappings.

Before any attempt is made to wrap articles they should be assembled into a compact pile or bundle, in such a way that when the wrapping paper is drawn around them there will be no avoidable hollow spots or irregular projections. Unavoidable hollow spots should be filled or projections should be suitably cushioned. Tight and compact packing is essential for safe handling. It is a good plan when several loose articles are to be wrapped in a single package to



Four Operations in Wrapping a Parcel.

fasten the articles together with string or sealing tape before they are wrapped. Loss or damage is almost certain to ensue when goods are so loosely packed as to allow any play.

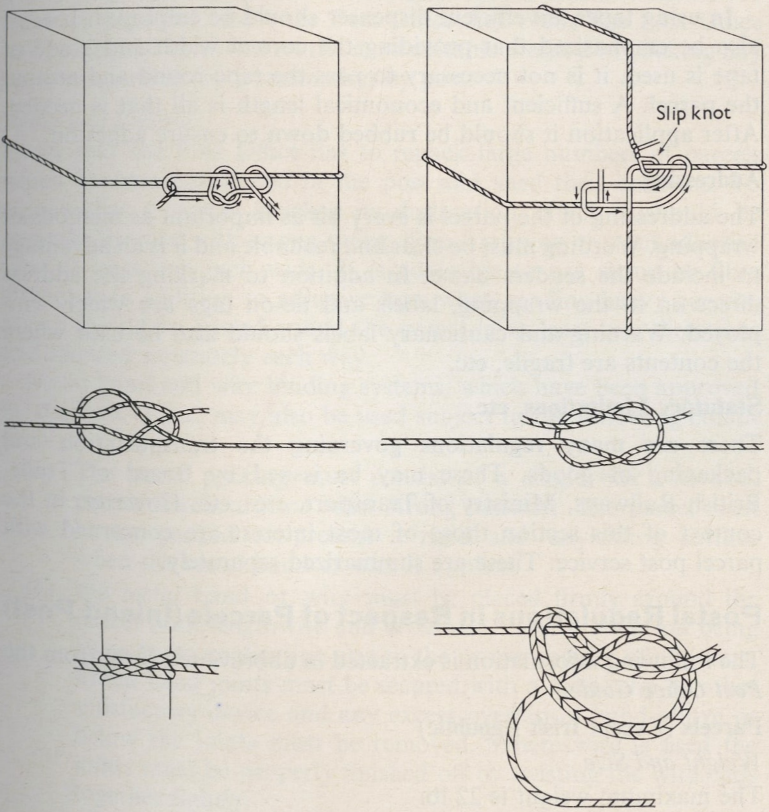


Alternative Method of Wrapping.

When paper is used as the sole protection it is important that the wrapper should be adequate both in quality and thickness. Thick paper is not necessarily the best; toughness and resistance to tear are most important factors. The sheets used should be large enough completely to encircle the package, allowing an ample overlap, and folded to cover both ends of the package when both ends are folded over. This will ensure complete protection of the contents of the parcel and permit of sealing by string, rope or sealing tape.

Paper should be drawn tightly around the package, and to prevent the rough edge of the paper from being exposed the edges should be folded over at the middle for the entire length of the paper, giving a double thickness as a guard against tearing. At each end of the package the overlapping paper should be folded in, preferably at such an angle as will allow the two ends of the fold to overlap. This method is illustrated with an alternative method commonly used by ironmongers and chemists.

Various Knots Used in Parcelling.



Closure of Parcels

The best wrapped parcels will not be satisfactory unless securely closed. Adhesives, twines and cords, gummed and pressure sensitive tapes are widely used. Once again a suitable grade is necessary according to weight of the parcel. No method will be satisfactory unless the pacel has been well wrapped with the outer paper tightly drawn around the contents.

When twine is used it should be strong enough to enable the parcel to be lifted by it without breaking. If there are any sharp edges, these should be protected to prevent chafing and fraying. Whilst it may be sufficient to pass the string round once in each direction, larger parcels, or those where the length is three or four times the width, should have two or more girth ties. Each crossing of the string should be knotted to prevent slipping and of course the entire length should be of one piece.

A small but important point when using twine is that care should be taken to pull the twine the correct way when it is wound in a ball *i.e.*, from the centre. This will prevent kinking or tangling.

In using tapes, an efficient dispenser should be employed. It must also be emphasized that providing the correct width and grade of tape is used, it is not necessary to pass the tape round and around the parcel. A sufficient and economical length is all that is needed. After application it should be rubbed down to ensure adhesion.

Addressing

The addressing of the parcel is every bit as important as methods of wrapping. Wording must be clear and readable and it is an advantage to include the senders name. In addition to marking the address direct on to the wrapping, labels and tie-on tags are widely employed. Warning and cautionary labels should also be used where the contents are fragile, etc.

Statutory Limitations, etc.

There are many regulations governing the transportation and packaging of goods. These may be issued by Board of Trade, British Railways, Ministry of Transport, etc., etc. However, in the context of this section those of most interest are concerned with parcel post service. These are summarized separately.

Postal Regulations in Respect of Parcels (Inland Post)

The following information is extracted in abbreviated form from the *Post Office Guide.*

Parcels (Except Irish Republic)

Weight and Size

The maximum weight is 22 lb.

The maximum dimensions are:

Length 3 ft. 6 in. Length and girth combined, 6 ft.

For example:

A parcel measuring 3 ft. 6 in. in its longest dimension may measure as much as 2 ft. 6 in. in girth, that is, round its thickest part; or a short parcel may be thicker; thus, if it measures no more than 3 ft. in length it may measure as much as 3 ft. in girth, that is, round its thickest part.

Packing and Make-up

General Information

Letters and postal packets of every kind, especially parcels, must be so made up as not only to preserve the contents from loss or damage in the post, but also not to injure other packets, or any officer of the Post Office. If insecurely packed they are liable to be stopped. The public are warned that packets insecurely packed which are likely to injure other postal packets in course of conveyance or any officer of the Post Office must not be sent by post and that the senders are liable to penalties under the Post Office Act 1953. The Post Office will be pleased to advise on the most suitable method of packing any particular article for transmission by post.

Tying and Sealing

Every year the Post Office has to repack large numbers of parcels which become unfastened in the post and shed their contents. To ensure that a parcel reaches its destination intact it should be securely fastened with strong string, fibre strapping or stout adhesive tape at least one inch wide. It is advisable to use string or fibre strapping in addition to adhesive tape when sending heavy parcels. String should be passed round the parcel in at least two directions and knotted separately each way.

Metal band and wire binding systems, which have been approved by the Post Office, may also be used subject to the following conditions:

(*a*) The outer packing must consist of a single box of wood, metal, fibreboard, or other strong material. The parcel must be so packed to present a rigid and unyielding surface when the metal band or wire is applied.

(*b*) the metal band or wire must be placed firmly around the parcel both lengthwise and crosswise, careful attention being given to its application and to the proper sealing of all joints. Metal band joints must be secured with a metal clip or other satisfactory device and any excess overlap of band above or below the joints must be removed. Where wire is used the joints must be properly finished off by twisting the wire ends together tightly.

(*c*) The metal band or wire must have no sharp edges or ends, must fit closely to the sides of the box or container and must be attached in such a way that it cannot injure officers of the Post Office handling the parcels.

(*d*) Parcels must in other respects be made up in accordance with the packing recommendations for certain articles.

Fragile Articles

Any fragile article whether sent by registered or unregistered parcel post, or registered letter post must be packed in a container of sufficient strength and surrounded in that container with sufficient and suitable soft material or wadding to protect the articles from the effects of concussion, pressure and knocks to which postal packets are ordinarily exposed in transmission, and the packet must bear the words *Fragile With Care* written conspicuously on the face of the cover above the address. It is recommended that all fragile articles should be surrounded in the pack by at least 2 inches of soft packing such as wadding, wood wool or similar material.

Methods of Address

Full details are published in the *Post Office Guide*, but the following information is of interest.

The directions about addressing letters, detailed in the chapter on Envelopes, apply equally to parcels, but in the interests of all concerned the following additional points should be observed:

1. Write or type the address plainly, preferably in bold BLOCK capitals, on the cover of the parcel itself and not merely on a label, which may become detached;

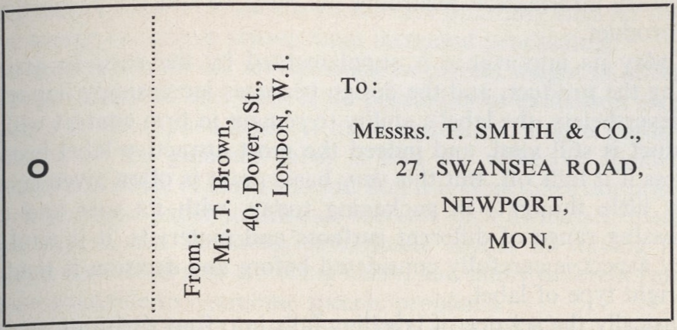
2. If a stick-on label is used see that it is securely affixed;

3. Any printed advertising matter or other non-address particulars on the label should be confined to the left-hand half as shown by the following illustrations:

Stick-on label:

This space may be used for any necessary printing. If the name and address of the sender is shown it should preferable appear at right angles to the address of the addressee.	To: MRS. M. SCOTT, 9, IVY STREET, HARROGATE, YORKSHIRE.

Tie-on label:



From:
Mr. T. Brown,
40, Dovery St.,
London, W.1.

To:

Messrs. T. SMITH & CO.,
27, SWANSEA ROAD,
NEWPORT,
MON.

4. In case the wrapping becomes damaged, or the parcel canno be delivered, the sender's address should appear both inside the parcel and on the cover. On the cover it should be kept distinct from the address to which the parcel is sent and should preferably be to the left of and at right angles to the name and address of the addressee.

British Standards

The importance of efficient packaging cannot be over-emphasized. In order to give some guidance in packaging problems, the British Standards Institution has produced a Code which is intended to assist firms in selecting packaging materials and using them to the best advantage. Information is given on almost all commonly used wrappers, containers and materials for all trades.

For the convenience of all concerned, the Code is being revised and published in separate sections, of which many are now available. As the subject matter is of necessity lengthy and comprehensive, it is not possible to deal with it in this section, although some references have been made where appropriate.

7. Labels, Transfers, Tags and Tickets

Adhesive Labels

Labelling is an activity which takes place regularly in every office, home and factory and one that is increasing yearly with the ever-growing use of packaging in this country. Labels come in a limitless range of sizes, shapes and colours and can be plain or printed by any process. A wide range of labels for use in office, factory and home is stocked by the good commercial stationer, and a considerable number of special printing orders is placed by the stationer with the various specialist firms on behalf of his customers.

The original purpose of the label was to identify, and to give the necessary information regarding the purpose and the properties of, the product.

Today its importance is supplemented by the need to assist in selling the product, and the design becomes increasingly important.

Nevertheless, the label's ability to remain in firm contact with the product is still vital, and indeed the most attractive label becomes useless if it falls off. But this very basic point is often given surprisingly little thought; in packaging today, with its vast and ever-increasing range of different surfaces and materials, it is vital that every aspect is carefully considered before any decision is made on the right type of label.

Basically the science of labelling falls into four divisions:—

(1) Plain paper labels applied with a separate liquid adhesive;
(2) Pre-coated gummed labels activated by water;
(3) Pre-coated labels with the adhesive activated by heat;
(4) Pressure-sensitive or self-adhesive coated labels applied by pressure alone.

Plain Paper and Separate Adhesive

Historically, the oldest method is where the label is a piece of paper printed by any of the available processes and the adhesive is applied separately before the label is attached to the article. This method is virtually used only in the industrial field, where the labels are likely to be specially printed. The label can be stuck on to the article either by hand or by machine, and a wide range of semi-automatic and automatic machines is in use in industry. The choice of paper, printing process, adhesive, and shape, which must include any positioning slots or indents, is a very technical matter and, if the job is a substantial one, an expert should be called in at the earliest possible stage.

Pre-coated Gummed Paper Activated by Water

An adhesive film of gum on the paper is moistened and allowed to become tacky before application. The paper is gummed in wide reels, using dextrine, gum arabic, or other formulations made up for special purposes. After coating, the crystals in the gummed film have to be broken up by a further process, so that the paper will stay flat under normal conditions. After re-reeling, the paper is slit in reel form for rotary machines or cut into sheets for other purposes.

The advantages of pre-gummed labels are speed and ease of application and complete cleanliness. In almost all cases in which the label is applied by hand, as opposed to semi-automatic or fully-automatic machinery, it can be shown that a pre-gummed label can be moistened and applied considerably faster than plain paper labels can be gummed and applied.

Although the initial cost of pre-gummed labels is higher than that of ungummed labels, in use the former are generally cheaper owing to the saving on labour arising from increased production.

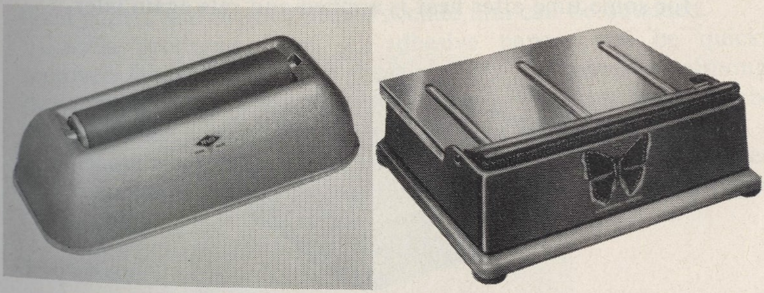
The gummed label will always carry its correct weight of adhesive for proper adhesion and there is no possibility of exudation around the edges of an applied label. It must be realized that a slight disadvantage of the gummed label is that the adhesive chemist is limited in his choice of materials and that it is sometimes not possible to stick gummed paper to difficult surfaces such as metals, plastics, waxed papers, etc. However, remarkable strides in solving these problems have been and are being made, and many different recipes are now available to overcome specific problems.

Where gummed paper labels are to be sent to the tropics or to any humid climate, care must be taken to see that they are either interleaved with wax tissue paper or that special tropical gummed paper is supplied. If this is not done the labels will stick together in a solid block.

Labellers and Roller Dampers

Gummed paper for labelling may be activated by extremely simple means. For hand use there is a labeller which takes the form of a rectangular metal bath with a polished chromium cover which acts as a slide; through one end of this lid protrude the tips of a brush, standing in water and keeping itself moist through capillary action.

Gummed labels can easily be passed along the slide, gummed surface downwards, beneath a pivoted weight and over the tips of the brush, which gives perfect moistening.



Labellers for Pre-Coated Gummed Labels Activated with Water.

Roller dampers, or moisteners as they are also called, fall into two categories—the single roller and the twin roller. Both types are available with roller lengths usually of from 4½ to 8 in. The rollers are easily removable for re-filling and for washing out the tank and rollers, which is advisable from time to time. The loss of water through evaporation is much less than with a sponge moistener, and the rollers turn at the lighest touch, revealing a constantly moist surface.

The advantage of the twin-roller action is that an even film of water is transferred to the upper from the lower roller which, by lifting water until the tank is almost empty, makes frequent "topping up" unnecessary. The rollers are normally rubber-covered, and the tank is made from plated steel. Seams are sealed to prevent leakage, and rubber feet on the base obviate noise and skids.

The single-roller damper is lighter in weight and is often in a plastic container, although china troughs with cloth-covered wooden rollers are sometimes found. The better models have the tanks so constructed as to avoid splashes when the damper is moved about, and the rubber feet give stability to the light-weight tanks.

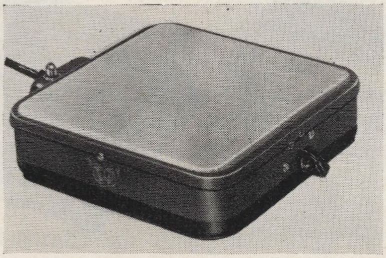
Semi-automatic or fully-automatic machines are also available for industrial use.

Pre-coated Gummed Paper Activated by Heat

This type of paper is in wide use in the food industry and in super-markets where much pre-packaging is done. Two forms of heat-activated papers are available:

(1) The instantaneous range, where the heat is applied to the paper whilst it is actually in contact with the article to be labelled. Heat passing through the paper melts the adhesive coating, which sets instantly when the source of heat is removed;

(2) The delayed action range, where the adhesive remains tacky for some time after heat is applied and sets again later.



Small Hot Plate for Pre-Coated Labels Activated by Heat.

The machinery available for heat-activated paper labels ranges from hot plates used in small units, such as the pre-packing department in a super-market, to costly automatic machines used in the large national companies. This type of label is not usually found in the stationer's shop.

Pressure-Sensitive Labels

Pressure-sensitive labels, also known as self-adhesive labels, are supplied with the adhesive coating in a permanently active state. The tackiness is protected by a silicone-coated backing sheet from which the label is easily removed.

Adhesive performance is divided into two categories:—

(1) Removable from surface as and when required;

(2) Permanent adhesion.

While most pressure-sensitive adhesives will adhere to an exceptionally wide range of materials, including waxed and varnished finishes, plastics and packaging films such as polyethelene and polypropylene, it is important that full information regarding both surface conditions and performance requirements are discussed at the outset.

Pressure-sensitive labels can be supplied in many forms:—

(1) In sheets with labels mounted in register for over-printing or writing on;

(2) In continuous roll form, often in dispenser cartons;

(3) Punched to special shapes as single labels. In this case removal of the protective backing is usually accomplished by either separation slits in the backing or "peel tab" provided in the punching stage.

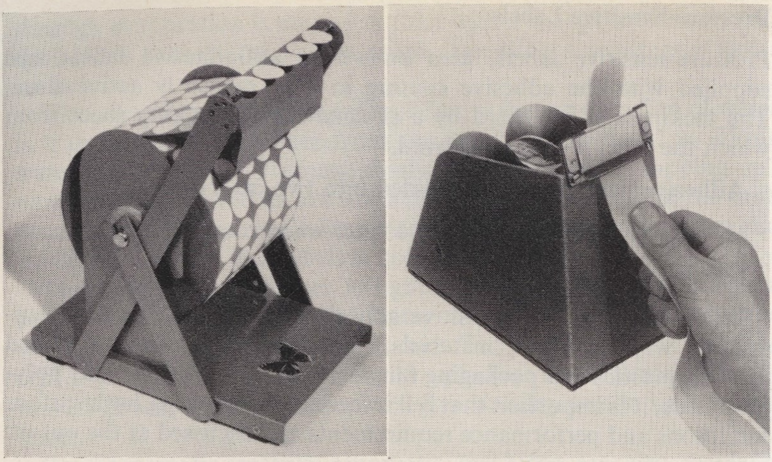
An extensive range of shapes and sizes—circular, triangular, rectangular and oval—together with a wide range of colours is commonly stocked, and for special purposes gold and silver metal-lined papers and bright-finished acetate film can be obtained.

Labels produced from self-adhesive papers can be quickly removed from the backing sheet and, as the adhesive, although tacky, does not transfer to fingers or to rollers, this form of label offers obvious advantages of cleanliness and versatility.

They are certainly the most advanced form of label yet produced, and their convenience and simplicity more than offset their higher initial cost.

Dispensers

Most labels in reel form are supplied in dispenser cartons if they are stock sizes. However, this is not always possible, particularly if the labels are over certain sizes. Dispensers of a more substantial nature are available for reels or flat sheets, and these may be semi or fully automatic. It is worth mentioning that certain specialized firms market a range of machines that will automatically print, price and code labels.



Pressure Sensitive Label Dispensers.

Stock of Labels Available

A wide range of labels is usually available in the average stationer's shop. A far wider range can also be obtained from the various suppliers, and there are one or two extremely good catalogues which can be used for demonstration to the potential customer, should the particular label wanted not be in stock. The more popular categories are as follows:—

(a) Plain Circular Gummed Labels

These labels, often called "gum spots," are extensively used in shops and warehouses for price marking and identification. They are also available in coloured paper, enormous quantities being used for colour-coding purposes in offices, warehouses and shops.

(b) Plain Self-Adhesive Labels

These are nearly always of the removable type and, in the stationery shop, are usually stocked in cheap packets, both in the sheet form and in the reel form, packed into a dispenser box. The small self-service packets have considerable sale in the domestic trade and to offices. Commercial packs of 1,000 labels, either in sheet form or in reel form, are also stocked in most good commercial stationery shops.

Coloured self-adhesive labels are not often stocked by the stationer owing to the wide range of sizes and colours available. The process makes it uneconomical to produce small quantities. Therefore if, as is often the case, the customer wishes to obtain a small quantity of coloured self-adhesive labels, care should be taken to see that only labels of a size and colour actually available from the manufacturer's stock are ordered.

(c) Border Labels

Invariably rectangular in shape, having a strong blue or red border all round the four edges, these labels are usually stocked in boxes of a thousand, or alternatively in the small self-service packs for domestic trade. They are widely used for parcel addressing, both domestically and in the smaller firm, and for file labelling, particularly in local authority offices and schools. They are available also in book form.

(d) Typewriter Gummed Address Labels

These are available, white only, either in perforated sheet form or in roll form. The advantage of these in perforated sheets is that, with the use of carbon, two or three sets can be typed at once. They are particularly useful in offices where constant mailing is being done. The advantage of typewriter labels in the reel is that each label feeds the next, but of course only one label can be typed at a time.

(e) Instruction Labels

These are available in different sizes and in a wide range of wordings such as "Glass," "Urgent," "With Care," etc., either in small boxes for office and domestic use or in boxes of 1,000 for use in factories and packing departments. These labels are also available in the self-service packet form.

(f) Account Reminders

Perhaps not properly called labels, these are usually stocked with the labels in a stationer's shop. They are used for attaching to statements or correspondence reminding the recipient that money is due. They range from the polite and supplicatory to the more forthright and urgent.

(g) Gummed Price Labels

These are rarely stocked by the stationer, but are frequently obtained specially by him for shopkeepers and business men in his locality. They usually consist of a white price printed in reverse on a red background and are available in a very wide range of prices and sizes. Today, they have largely been superseded by other methods of pricing.

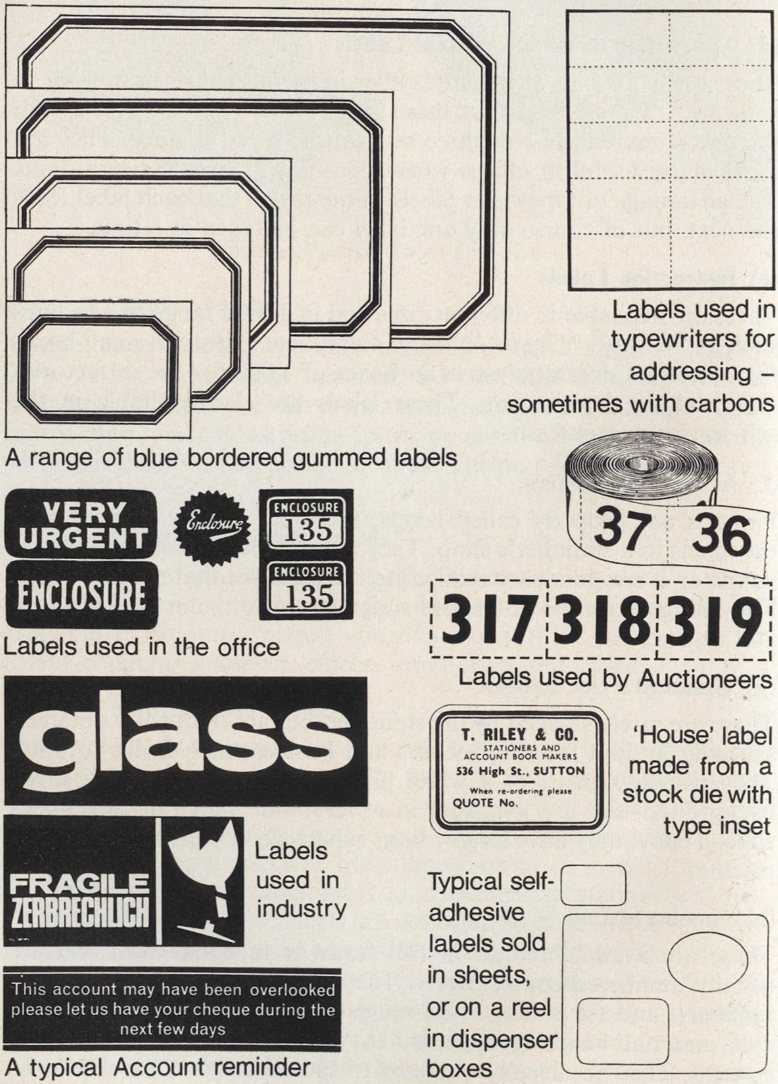
(h) Numbered Labels

These are available either in roll form or in book form and are usually numbered consecutively. They are used for auctioneers' lot numbers, and for a very wide range of purposes in stock-keeping and material handling systems, as well as for controlling filing systems. They are usually obtained to special order. Care should be taken to see that the size of number and precise numbering scheme are clearly stated to the supplier. Again, reference to one or two of the standard trade catalogues will often help.

(i) Statutory Labels

These cover a range of labels which are not generally found in, or indeed handled through, the stationery shop, but which may well

Labels found in the stationer's shop *


VERY URGENT
ENCLOSURE
Enclosure
ENCLOSURE
135
ENCLOSURE
135
37
36
317
318
319
glass
T. RILEY & CO.
STATIONERS AND ACCOUNT BOOK MAKERS
536 High St., SUTTON
When re-ordering please QUOTE No.
FRAGILE
ZERBRECHLICH
This account may have been overlooked please let us have your cheque during the next few days

A range of blue bordered gummed labels

Labels used in typewriters for addressing – sometimes with carbons

Labels used in the office

Labels used by Auctioneers

'House' label made from a stock die with type inset

Labels used in industry

Typical self-adhesive labels sold in sheets, or on a reel in dispenser boxes

A typical Account reminder

Varieties of Gummed Labels.

become more important as time goes on. Since 1965 it has been necessary for all shippers of dangerous goods which have to be carried by sea to use, on those goods, warning labels printed to a standard design. They are frequently called "imco" or "standard" labels, and are illustrated in one or two of the trade publications; alternatively details can be obtained from the Board of Trade.

(j) Miscellaneous Labels

Many other labels are produced as stock lines, plain or printed for a particular use. Examples are sale labels, book labels, luggage labels, garment labels, enclosure labels, bottle labels, etc. This range is almost inexhaustible.

(k) Specially Produced Labels

In addition to those available from stock, vast quantities are specially produced to order. Virtually any material, either plain or printed by any process, to any required wording or design. The specification and choice of any one type will depend to a large extent upon the use and application. Examples are for branding, identifying, pricing, instructional and warning purposes. Labels for computer and tabulator use are now in increasing demand and the potential should not be overlooked.

Manufacturers are always willing to assist with labelling problems and their advice should always be sought at an early stage of the enquiry.

Transfers

A transfer is a means of branding or labelling and is particularly suitable for smooth surfaces, such as glass, metal or enamel, although they can be made for use on almost any surface. They are used in many trades, where other means of labelling or printing is impractical, or for reasons of economy or permanency.

The design or wording is printed on to a specially prepared backing sheet; when the transfer has been moistened (except for self adhesive transfers) and applied to the surface, the backing sheet can be slid or peeled away from the transfer. They can be supplied in practically any shape or size; printed in any colour or combination of colours, including metallic or fluorescent inks. Letterpress, lithographic or silk screen processes are employed. After transfer they become permanent and waterproof.

There are various methods of fixing the transfer:—

Self Adhesive: This type is now the most widely used, since no moisture is required, no drying time is involved and they are easily and quickly applied. The backing paper is peeled off, the transfer pressed into position and then the cover paper pulled away.

Waterslide: Prior to the introduction of the self-adhesive transfer, these were the most widely used. They are moistened with water and "slid off" on to the surface.

Varnish Fixed: These were the original transfer, fixed as the name suggests by varnish. They are slow to use, but suitable for designs that include large areas of print.

Spirit Fixed: These are a development of the varnish type and have their own varnish on the back. Fixing is by wiping over with methylated spirits and water.

Solution Fixed: Sold under proprietary names, these are fixed by manufacturers own chemical solutions.

Applications to which transfers can be put are many and varied. They are used on a wide range of products including toys, sports goods, tools, cycles, vehicles, etc.

For window signs they can be of negative or positive design for fixing on the front or the back of the glass. Where the design is required to be seen on both sides double-sided transfers are used.

For pottery and glass they are printed in vitreous colours, which are fixed at high temperatures to the product. Enamelled iron transfers are also printed in vitreous colours on special paper for fixing into vitreous enamel ware.

Not strictly in the same category as other transfers, are "dry transfers." They are used for design and layout work, and also in preparatory work for certain printing processes. These are detailed in the chapter covering Drawing Materials under the heading of Graphic Design Materials.

Pressure Sensitive Transfer.

Tags

Definition and Sizes

A tag may be defined as a label cut to shape, with a suitably positioned hole which is reinforced by a washer affixed to the label around the hole.

Tags are used as a means of attaching information of a temporary or semi-permanent nature to goods and packages for the purposes of identifying them, marking them suitably for transportation or adding instructions or information about the product or package.

Shapes of tags are as illustrated, and generally accepted sizes are as set out below.

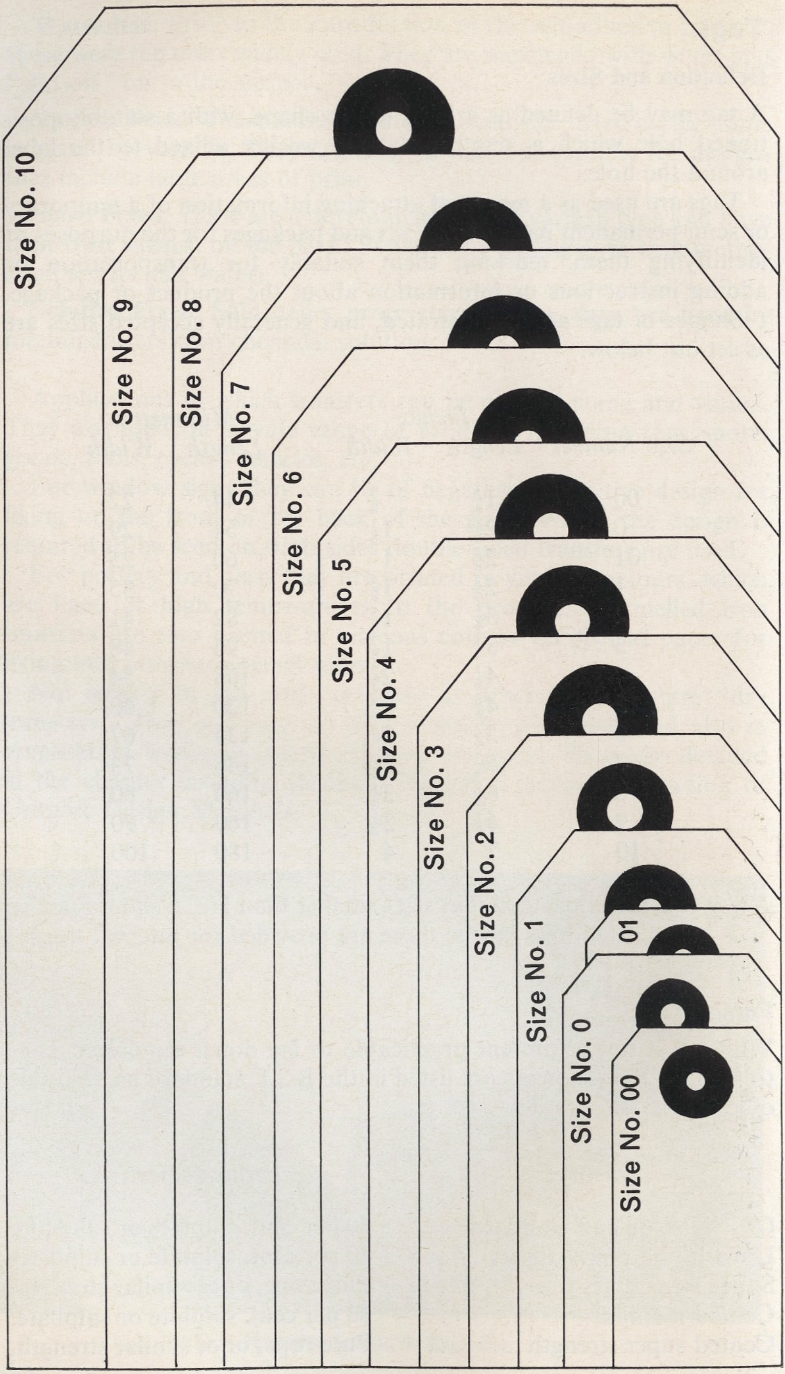
	Inches		*Millimetres*	
Size Number	*Length*	*Width*	*Length*	*Width*
00	1¾	⅞	44	22
0	2⅛	1⅛	54	29
01	2⅜	1	60	25
1	2¾	1⅜	70	35
2	3¼	1⅝	82	41
3	3¾	1⅞	96	48
4	4¼	2⅛	108	54
5	4¾	2⅜	120	60
6	5¼	2⅝	134	67
7	5¾	2⅞	146	73
8	6¼	3⅛	160	80
9	6¼	3½	160	90
10	7	4	180	100

Note: It is recommended that sizes smaller than No. 5 should not be used as address labels; these are provided for internal use.

Furnish

Whilst it is not at present practicable to lay down requirements as to furnish, the following are listed in the B.S.I. standard as desirable objectives.

Quality	*Furnish objective*
Off-white, or buff standard	80 per cent. sulphite or sulphate.
Dyed in the pulp colours	80 per cent. sulphite or sulphate.
Super strength buff	Pure rope, or of similar strength.
Coated manilla	80 per cent. sulphite or sulphate.
Coated super strength	Pure rope, or of similar strength.


Size No. 10
Size No. 9
Size No. 8
Size No. 7
Size No. 6
Size No. 5
Size No. 4
Size No. 3
Size No. 2
Size No. 1
01
Size No. 0
Size No. 00

Tie-on Tags (Actual Size).

Calipers

The caliper of the materials used varies from 0·008 in. to 0·016 in., and the boards used are, generally speaking, manilla, sulphite or sulphate. The B.S.I. standard for tie-on tag address labels made from these cellular fibres is as follows:

Quality Reference	*Thickness ins.*	*Substance lb./Rm. DC. 500*	*Thickness mm.*	*Substance* g/m^2
Off-white or buff standard ..	0·008	80	0·2	180
	0·010	100	0·25	224
	0·012	120	0·3	280
	0·014	140	0·35	315
	0·016	160	0·4	355
Dyed in the pulp colours ..	0·010	100	0·25	224
	0·012	120	0·3	280
Super strength buff ..	0·016	160	0·4	355
Coated manilla ..	0·014	140	0·35	315
Coated super strength	0·016	160	0·4	355

Note: The substances in grammes per square metre are taken from the R.20 series of preferred numbers given in the relevant B.S.I.

Note 2: Recommendations regarding the use of these tags are given below.

Uses

Some of the main uses of tags are itemized below:—

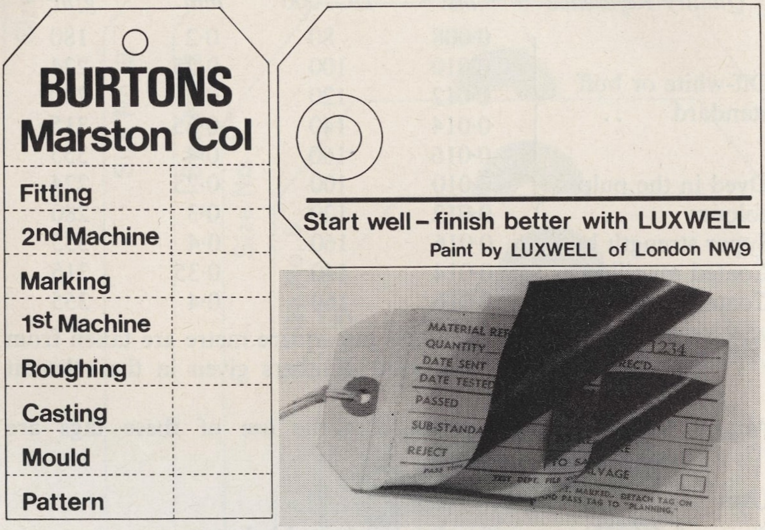
(1) Addressing goods for transit. The normal tie-on address tag is extremely well known and in its simplest form is merely a means of adding an address to a package to enable it to be conveyed from one point to another. There are, of course, many variations on this, and in its more sophisticated form the tag is used to identify particular pieces of baggage or packages by making it two-part, with the same numbering on each part of the tag.

(2) In a similar manner tags can be used for progressing the manufacture of goods through a plant by being made in a number of parts so that each production operation can be identified on the tag, thus ensuring continuity through the production cycle.

(3) Tags can be used also for stock control by being affixed to manufactured items or bins of manufactured items, thus identifying the contents and keeping a record of goods in and out of warehouses or stockrooms.

(4) Tags are used also as a simple means of product identification by being attached to products so as to identify them and their usages or other relevant information that may be required.

(5) Tags can be used to carry instructions as to the use or fitting of a particular product where the information is either of a temporary nature—*i.e.*, is not needed after the product has been installed or used for the first time—or to carry a warning of danger, as in the case of wiring-up of electrical equipment, as well as fitting instructions, assembly instructions and similar information of a temporary nature.


BURTONS
Marston Col
Fitting
2nd Machine
Marking
1st Machine
Roughing
Casting
Mould
Pattern
Start well – finish better with LUXWELL
Paint by LUXWELL of London NW9
MATERIAL REF
QUANTITY
1234
DATE SENT
DATE TESTED
RECD
PASSED
SUB-STANDA
REJECT
SALVAGE

Examples of the Use of Tags.

(6) As a tag is an article which, generally speaking, is temporarily affixed, information of a permanent nature which is required for continuous operation of a product is normally either firmly attached to the product, if possible, or contained in an instruction book where it is permanently available.

(7) Tags are used also for the recording of information where this has to be collected over a relatively short period and is finally collated into a more permanent record or is no longer needed once the cycle of operations has been completed.

(8) Tags are extremely useful for temporary identification of articles or products and, as mentioned above, can be used for the temporary marking of baggage, a duplicate portion of the tag being retained by the owner for subsequent identification at a later date. They can also be affixed to articles which for one reason or another are deposited outside the owner's control and need to be subsequently re-claimed, as, for example, in the case of shoe repair tags, where part of the tag is attached to the shoes to be repaired

and part is retained by the owner so that his property can be claimed when the repairs are complete. Similar usages are for left luggage and the identification of any property left for a relatively short period.

(9) Tags can be used also for advertising purposes where, as well as serving a utilitarian purpose, they can carry an advertising message.

The above notes outline some of the major usages of tags, but of course there are many variations applicable to particular circumstances.

Tie-on Address Tags

The following notes are included in the B.S.I. standard as a guide to the various purposes for which the recommended qualities are suitable:

Off-white or buff standards. Caliper 0·008 *in.* (0·2 mm.)
For internal applications and very light work.

Off-white or buff standard. Caliper 0·010 *in.* (0·25 mm.)
For small size tags and for light packages sent by post or carrier, where much handling and long distance transportation are not entailed.

Off-white, buff standard or dyed in the pulp colours. Caliper 0·012 *in.* (0·3 mm.)
As above, but for larger tags. This quality is suitable for parcel post and general purposes.

Off-white, buff standard, or coated manilla (*white and coloured*). *Caliper* 0·014 *in.* (0·35 mm.)
Especially suitable for personal baggage, and for heavier and more valuable goods than the above, or those sent by rail where much handling occurs.

Off-white or buff standard. Caliper 0·016 *in.* (0·4 mm.)
Essential for bulky goods or where merchandise has to be transhipped frequently. This quality is both tough and durable.

Super strength buff, and coated (*white and coloured*). *Caliper* 0·016 *in.* (0·4 *mm.*)
As its classification implies, this type is for heavy machinery and expensive goods. It provides considerable strength and durability.

Washers. These should not be less than 0·010 in. (0·25 mm.) thick. Substance should not be less than 100 lb./Rm. DC. 500 (224 g/m^2).

String. This should have a minimum breaking load of 15 lb.

Methods of Attaching.

Basically, tags have to be attached to an article in such a way that they remain attached while the information that they carry is required, but can subsequently be removed. They must therefore be of sufficient strength to withstand handling and transit, and also must be produced of materials which are economical for the purpose. Consequently there is a variety of strengths of material and types of attachment for different applications. They can also be perforated, numbered and printed according to use.

(a) Strings: The most obvious way of attaching a tag to a package or article is by tying it on with string. Again, depending on the usage, so the type of string can be varied. For a light, small article not requiring great strength a small tag and a thin string are acceptable: for rougher handling and usage, a stronger tag and a more durable string are obviously required. Therefore these are selected to suit the particular needs of any application.

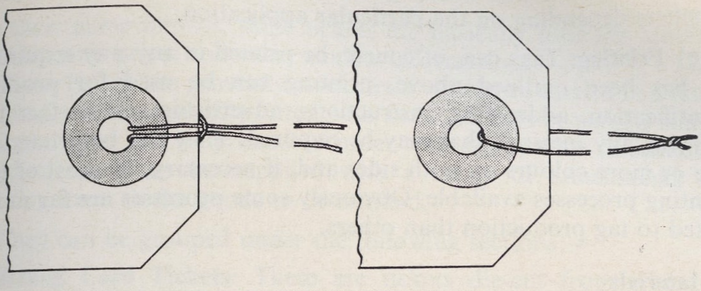
(b) Eyelet: Where required, increased strength in a tag can be obtained by inserting a metal eyelet in the centre hole of the washer of the tag. This acts as a reinforcement giving additional strength to the tag.

(c) Wires: For particular applications a wire can be inserted into the tag and secured by twisting. This is a particular use where the tag has to be attached to difficult articles such as metal rods or bars, or has to be affixed tightly in position on an article where string, if used, would be liable to damage, leading to loss of the tag.

(d) Spring Clips: The spring clip is another method of attachment which has particular applications—for instance, in labelling sacks or similar materials, where the spring clip can be forced through the material so as to form a very firm attachment.

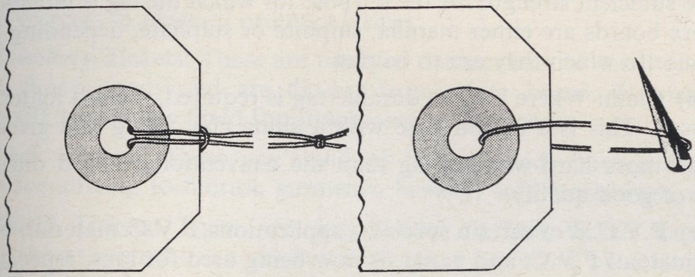
(e) Perforations: Tags can be perforated in any desired position to enable parts to be detached when required. This is particularly applicable to the use of tags in production operations, stock control and similar usages. The perforated portion can form the basis for payments for piece-work or operations carried out and can form a useful means of progress control, quality control and the identification of manufactured parts against operators and machines producing them. As has already been outlined above, one very common use is for relating a particular package or product to a specific owner by having the same number on each part of a tag, one part of the tag being attached to the package and the other being retained by the owner. This, of course, can apply to many operations where identification is required in two or more places.

(f) Numbering: Mention has already been made of identical numbers on various parts of tags, but numbered tags can be used for many other purposes. Consecutively numbered tags can be used to identify any sequence of operations, groups of products, etc., and can form a very useful record of quantities produced, etc. Tags can



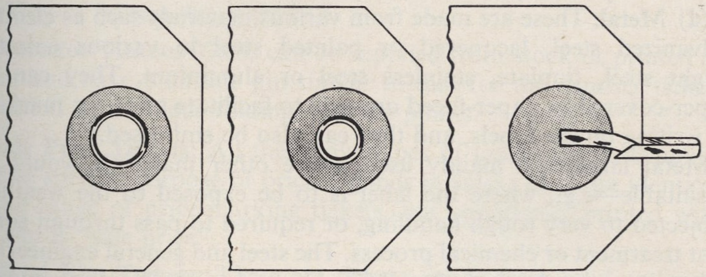
Looped Open Ends

Threaded and Knotted



Looped and Knotted

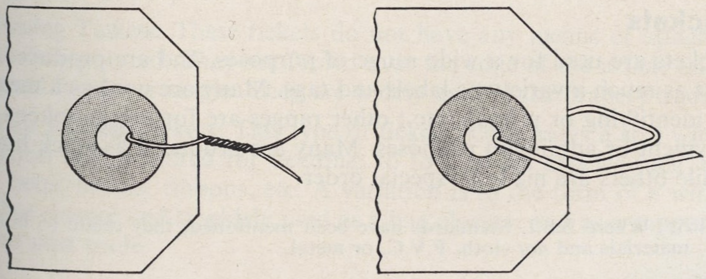
Strung Barbs



Large Brass Eyelet in Washer

Small Brass Eyelet in Washer

Sack Hooks



8 in Wires

Spring Clips

Tag Attachments.

be numbered in almost any position and in a variety of size and numbers depending on the particular application.

(g) Printing: Tags can, of course, be printed in any way required. As has been outlined above, printing can be used for product identification, addressing, instructions, advertising and in fact for carrying any message that may be required. They can be printed in one or more colours on both sides and, if necessary, by most of the printing processes available. Obviously some processes are far more suited to tag production than others.

*** Materials**

(a) Boards: The normal tag is manufactured from boards which have sufficient strength for the purpose for which the tag is intended. These boards are either manilla, sulphite or sulphate, depending on the use to which they are to be put.

(b) Cloth: Where a more durable tag is required, a cloth material is used. This is a cotton base with a china clay filling and gives a much more hard-wearing tag than the conventional board one, if it is of good quality.

(c) P.V.C.: For certain specialist applications, P.V.C. material, or a laminate of P.V.C. and paper, is now being used for tags, especially where a more hard-wearing and durable tag is required in place of the conventional board. It is waterproof, oilproof and resistant to weak acids and alkali.

(d) Metal: These are made from various materials such as electro-galvanized steel, lacquered or painted steel in various colours, bright steel, tinplate, stainless steel or aluminium. They can be paper-covered or paper-faced one side to facilitate printing, marking or writing on the labels, and they can also be embossed.

Metal labels are mainly used where other materials would be unsuitable—*e.g.*, where the label is to be exposed to the weather, subjected to very rough handling, or required to pass through some heat treatment or chemical process. The steel and general engineering industries, wire-drawers, foundries, car and aircraft manufacturers are all users of metal labels.

Tickets

Tickets are used for a wide range of purposes, and are produced in just as much a variety as labels and tags. Many are used as a means of identifying or pricing, etc.; other ranges are for use as tokens of payment or admission purposes. Many are produced as stock lines, while others are made to special order.

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* NOTE: Where B.S.I. Standards have been mentioned, they relate to board materials and *not* cloth, P.V.C. or metal.

Merchandise Tickets

As their name implies, these tickets are basically used for marking articles with prices and other similar information.

These tickets are generally stock items which are carried in a range of shapes and sizes and printed with stock borders or similar simple designs. They can be printed to order with any specific information required and can be supplied with a range of attachments for affixing them to the goods to be marked.

They can be grouped under the following sections:—

Strung Card Tickets: These are tickets die-cut from white or coloured coated and uncoated boards. They can be fitted with white or coloured strings and can be supplied with brass eyelets or strings and piercers in place of ordinary strings.

Jewellery Tickets: These are used for the marking of small goods and fancy goods and are die-cut from white board. Normally, fine silk strings are fitted for attachment to the goods.

Lock Tickets: These are standard tickets which have a metal clip for affixing to fabrics, garments, hosiery, soft furnishings, etc.

Shield Tickets: These are very similar to lock tickets except that the attachment is a single pin which is protected by a tongue which folds over the point to protect the fingers of people using them from injury.

Clincher Tickets: These are tickets fitted with a double pin for the marking of fabrics, hosiery, etc.

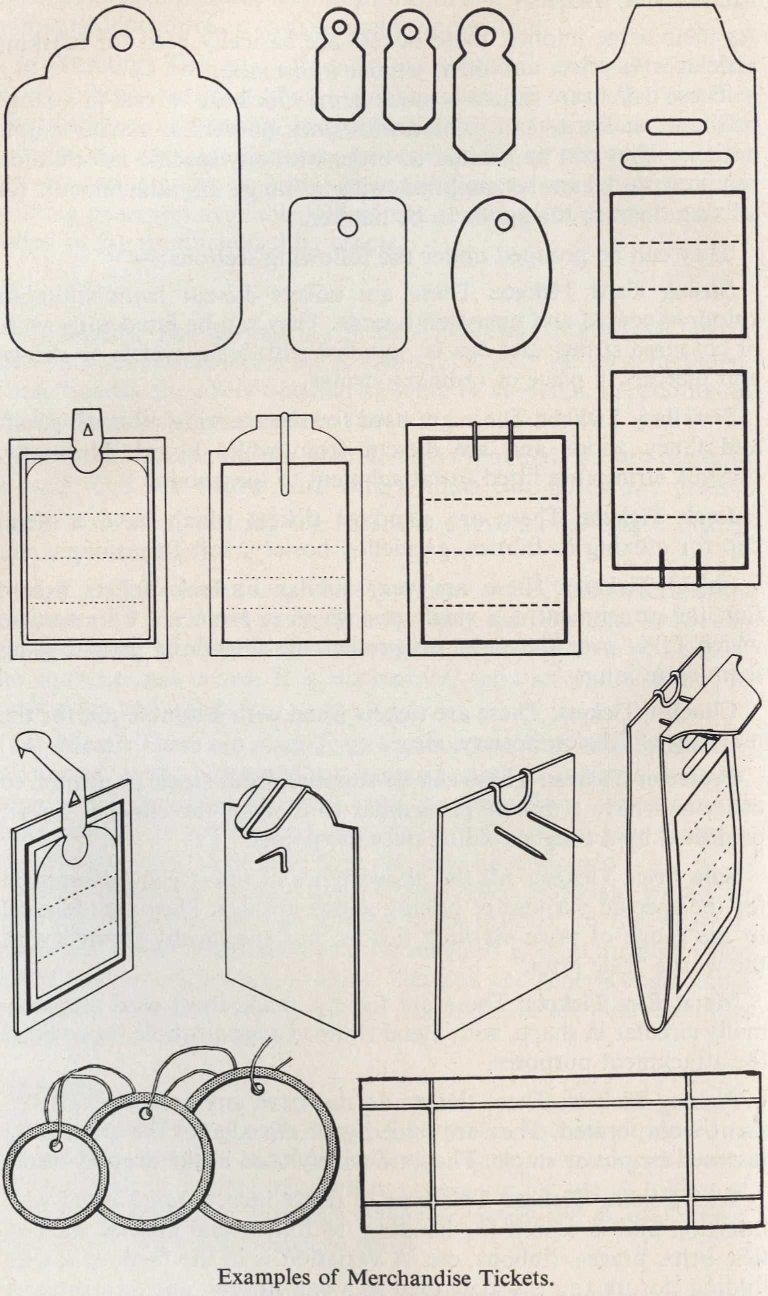
Protector Tickets: These can be supplied from stock or printed to order and have a double pin similar to that for the clincher ticker, protected by a tongue folding over the points.

Sale Price Tickets: All the above types of ticket can be supplied for the specific purpose of pricing goods in sales. They are identical to the range of price-marking tickets, but specifically printed with the words "sale price".

Metal Rim Tickets: These are tickets, made from card and normally circular in shape, with metal rimmed edges. A hole is provided for attachment purposes.

Pinning Tickets: These tickets do not have any means of attachment incorporated. They are folded over the edge of the article and fastened by pin or staple. They are widely used in the drapery trade.

Wire Folding Tickets: This type of ticket incorporates a soft wire insertion and is scored for bending, to fold round articles such as ties, belts, braces, ribbons, etc. A variation is in the form of a wire folding closure and is widely used as a bag closure, and as a support in the shirt trade.



Examples of Merchandise Tickets.

Swing Tickets

A swing ticket may be defined as a label cut to shape with a suitably positioned hole through which a string is fastened for attaching the ticket to the article to be labelled.

Shapes of the tickets are decided by the customer's requirements and, generally speaking, they are not standard.

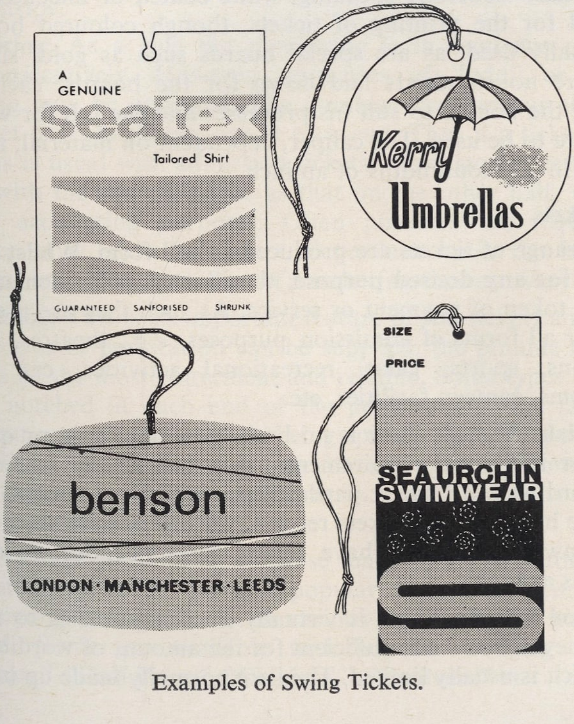
Swing tickets are used as a means of attaching information to an article for the purpose of identifying the article, advertising it, attaching instructions as to washing and cleaning, etc., or showing the price.

Uses: Some of the main uses of swing tickets are set out below:—

(1) In the garment trade: for price marking, identifying and advertising garments.

(2) In many other trades: for identifying articles and giving information about them. They can be used in almost any product range for the various purposes set out above.

(3) As a means of conveying information, instructions as to how products should be used, or warning instructions (as on electrical goods), and washing instructions, dry-cleaning instructions, etc. on garments.


A GENUINE
seatex
Tailored Shirt
GUARANTEED SANFORISED SHRUNK
Kerry
Umbrellas
benson
LONDON · MANCHESTER · LEEDS
SIZE
PRICE
SEAURCHIN SWIMWEAR
S

Examples of Swing Tickets.

(4) Price marking.

(5) Advertising.

(6) Particularly in the garment industry, their use for size marking and colour identification is invaluable.

(7) In effect they can be used for the display of information on any article to which they can be attached by a string.

Fastening: White or coloured strings of varying lengths can be fitted to tickets. The average length of strings is between 8 in. and 14 in. These strings can be made of any suitable cotton or synthetic material, and special colours can be obtained if required. In order to strengthen the ticket, brass eyelets can be fitted into the hole.

Printing: The tickets can be printed in any number of combination of colours and can be of simple or very complicated design. All the printing processes can be employed on the printing and production of tickets. In addition, tickets can be perforated for two-part use or more, and numbered in any position required.

Shape: Tickets can be cut to any shape that is required, though the majority are of a fairly plain rectangular, circular or other simple design. However, very complicated shapes can be supplied if required.

Materials: Generally speaking, white coated or uncoated boards are used for the printing of tickets, though coloured boards are occasionally used, as are special boards such as gold, silver, etc. There are no standards laid down for the boards, each printer selecting the boards to suit his processes and the job for which the tickets are to be used. The caliper, dependent on material, may vary from 10 to 20 thousandths of an inch.

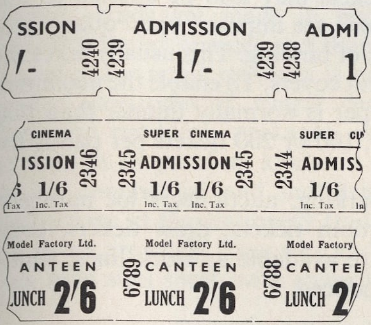
Roll Tickets

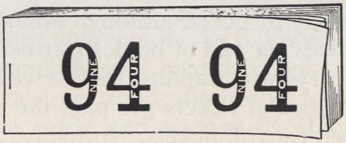
A wide range of tickets are produced in roll form. Whilst they can be used for any desired purpose, the most popular demand is for use as a token of payment or service. As such they are used extensively for all forms of admission purposes, *e.g.*, theatres, cinemas, exhibitions, sports, galas, recreational activities, car parking, cloakrooms, canteen facilities, etc.

Materials: Though there is no limitation as to type or quality of paper for individual requirements, they are mostly made from a thick, hard wearing, ticket paper. These are strong enough to withstand the handling the tickets receive, yet inexpensive since they are thrown away once they have served their purpose. A range of colours is available.

Size and Length: There is virtually no limitation as to size, but mostly they are of a size sufficient for the amount of wording necessary, which is usually limited. They are normally made up in reels of

500 or 1,000, as these are reasonable quantities and keep each reel to a convenient size. Usually they are reeled on a centre core. When tickets are required for use with automatic ticket issuing machines the manufacturers should be consulted or advised as to type of machine, etc., so that the correct specification is supplied.





Above: Book Form Tickets.

Left: Roll Form Tickets.

Printing: The tickets may be printed one or both sides in any colour of ink. Where the range of coloured papers is insufficient, or for other special purposes, a further variety of ticket may be obtained by printing a second colour, usually in the form of a band or stripe.

Numbering: As a rule the numbering is in sequence of single digits consecutively. However, sequences of "odd" or "even" numbering may be arranged. The numbers may appear singly on each ticket or in duplicate, one at each end. Thus if a ticket is torn in half, as is usual with admission tickets, the customer retains one portion with the same number as that on the other half, which is kept for accounting purposes. Often numbers are required to commence at a particular figure, dependent upon the last of a particular batch of tickets. Size of numbering too, can vary.

Perforation: This is an important feature of roll tickets and whilst various forms of perforation can be supplied, the pinhole type has proved to be the most convenient and reliable. Some types of ticket are also notched at each end of the perforation. This facilitates detachment and prevents tickets being spoiled by tearing off at the wrong place. The perforating may be arranged horizontally for single tickets, or in addition, vertically in several positions to make duplicate or triplicate tickets.

Stock Tickets: In addition to those made to special order, there are also stock varieties. The more popular of these are printed with prices ranging from ½d. to 5s. in various colours, single or double numbered. Some are available with popular wording such as "Admission," "Half Price," "Children," "Canteen," etc.

Tickets in Pad or Book Form

For reasons of convenience or use, tickets may be made up in pad or book form. Where any form of writing is necessary on the ticket, such as filling in car registration numbers on car parking tickets, this form is essential.

The comments made on roll tickets may also be applied to this variety of ticket, although limitations are imposed upon quantity of tickets per pad or book for reasons of binding. This usually takes the form of wire stapling, with or without covers. To enable the maximum number of tickets per pad, the paper is normally thinner than that used for roll tickets. Normally, 50, 100 or 200 tickets per pad is the most convenient.

Examples of use are for car parking, auctioneers lot numbers, advanced booking tickets, cloakroom tickets, draw tickets, competition tickets, etc. Some types are available as stock lines, whilst many of necessity are specially produced.

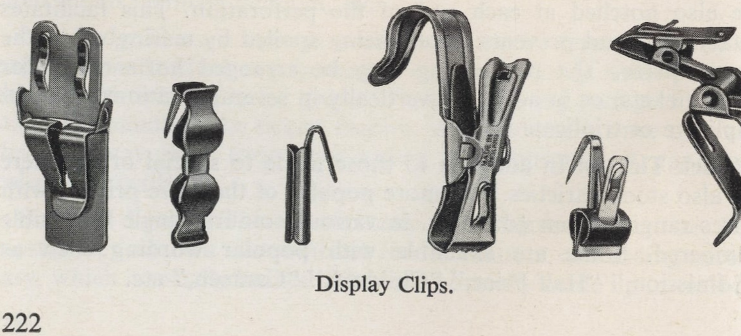
8. Display Accessories

Under this heading are grouped those items that, in one way or another, are used for a display purpose. The requirements of display generally, covers a wide, varied and sometimes specialist field, involving many different trades. The section however is only concerned with those items traditionally sold by the stationer, which are popularly used in retail trades of all kinds, as well as in industry and commerce, and even in the home. In addition to being a natural distributor, he is also a major user.

Small Display Fittings

Hooks, Pins and Clips

In the main these are used for hanging, pinning or clipping very small price tickets and labels on to products and materials for sale or display in shops, warehouses, showrooms, sample rooms, etc. One or two have obvious uses in the home for hanging calendars, Christmas cards, etc.

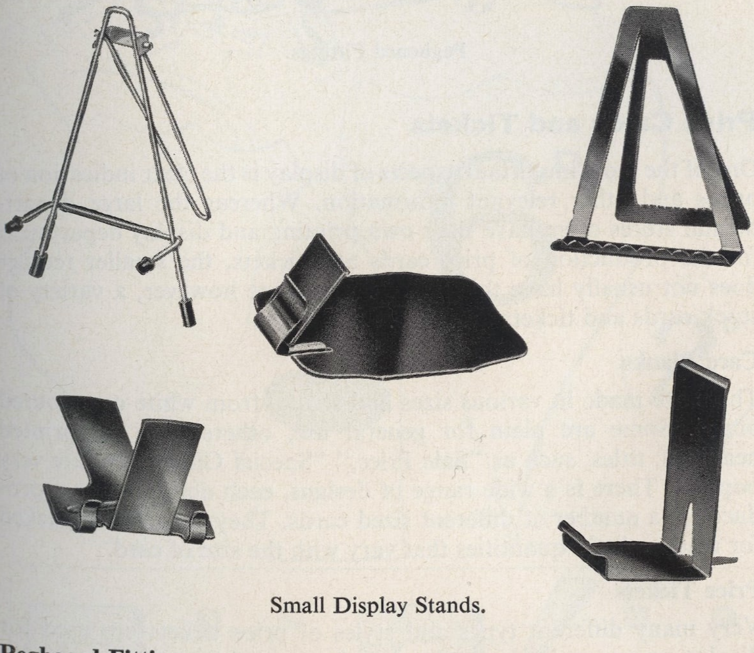


Display Clips.

They are usually made from spring steel. Finishes are mostly blue or brown, with protective lacquer coatings: some are nickel-plated. Most are boxed in $\frac{1}{4}$, $\frac{1}{2}$ or 1 gross lots, but one or two lines are carded for self-selection.

Display Stands

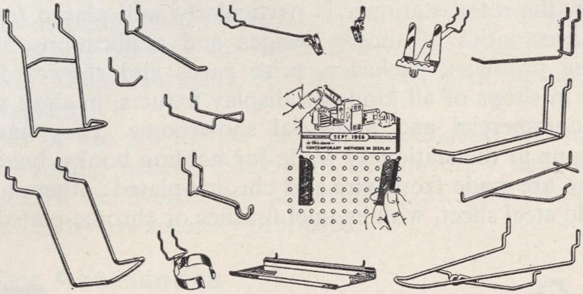
Display stands are made in many shapes and sizes. There are specialist display services and shopfitters who handle the full ranges. However, the retail stationer is particularly well placed to sell the smaller accessories of simple designs and applications, used for displaying products, packages, price cards and showcards. They are used in shops of all kinds on display fixtures, in shop windows and in commercial and industrial showrooms. They have many applications in the stationery trade for holding books, boxed lines, etc. Some are made from wire and chrome-plated: others are made from mild steel sheet, with enamel finishes or chrome-plated.



Small Display Stands.

Pegboard Fittings

This is a range of products made from chrome-plated, wire and designed to fit perforated hardboard sheets. Their versatility, simplicity and speed of use are quite outstanding. Low in cost, they are extremely popular for display and product suspension purposes everywhere, including the home for applications in kitchens and cupboards. They offer excellent display facilities for walls, pillars, floor stands and alcoves. They are ideal for converting awkward, hard-to-use areas into profitable and attractive display points. Several fittings are designed to dispense goods specially packaged for self-service and self-selection. They are supplied in boxes, usually containing from 1 to 3 dozen pieces of each type. Some of the most popular fittings are illustrated.



Pegboard Fittings.

Price Cards and Tickets

One of the most important aspects of display is the clear indication of prices and other relevant information. Whereas the large departmental stores often have their own printing and display department for the production of price cards and tickets, the smaller retailer does not usually have this facility. There are however, a variety of stock cards and tickets available.

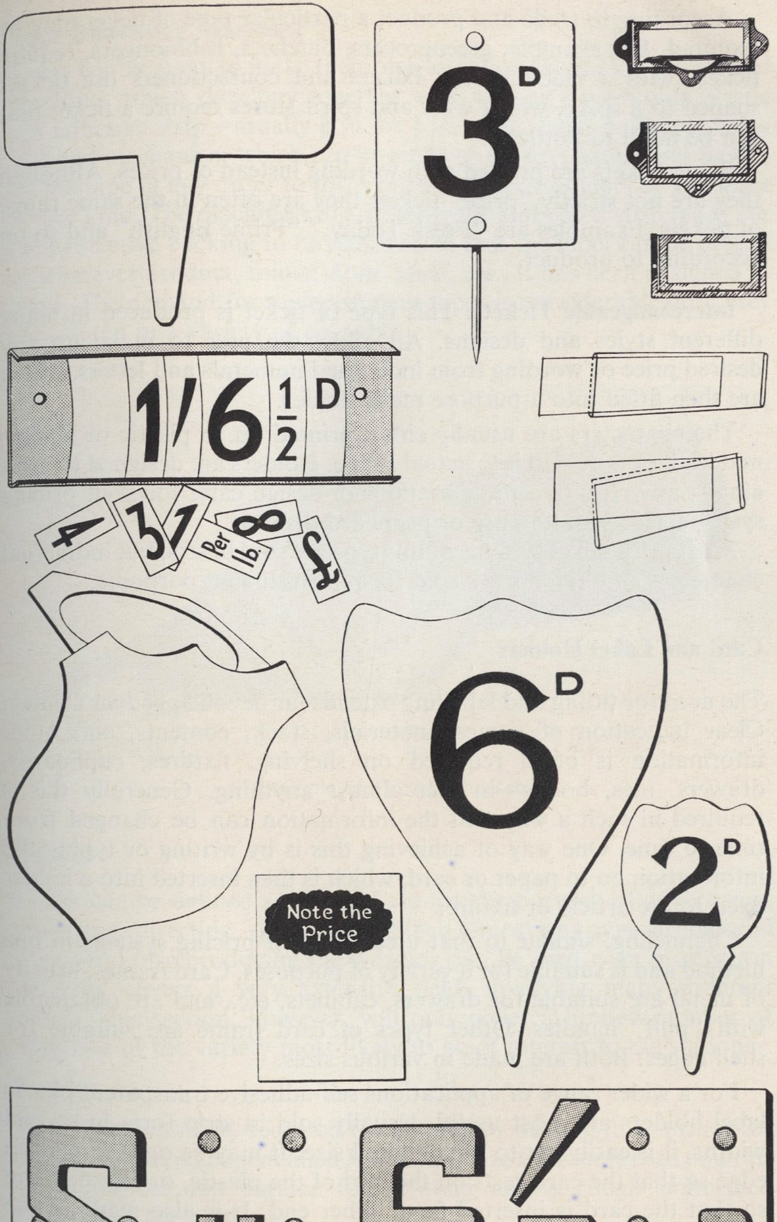
Card Blanks

These are made in various sizes and shapes from white or coloured board. Some are plain for general use, others have pre-printed headings; titles, such as “Sale Price,” “Special Offer,” etc., are very popular. There is a wide range of designs, each design being reproduced in a number of different sized cards. They are usually packed for ready sale, in quantities that vary with the size of card.

Price Tickets

Very many different types and styles of price tickets are used for display purposes. Basically they can be divided into two groups.

Individual: As with card blanks, these are made in various shapes and sizes. The predominant materials are card and plastic. The latter is essential in some trades as they are easily cleaned. All are printed in a range of prices and some are adjustable, so that price changes can be made from time to time.


3D
1/6½D
4
3
1
Per lb.
8
£
6D
2D
Note the Price
SH. 6/-3

Varieties of Display Price Tickets and Card Holders.

According to trade and product a particular type of ticket may be required. For example, greengrocers, butchers, fishmongers, require tickets with a metal prong; bakers and confectioners use tickets shaped to a spike, whilst wine and spirit stores require a ticket that can be fitted to bottles.

Some tickets are printed with wording instead of prices. Although they are not strictly "price" tickets they are often in the same range of tickets. Examples are "Fresh Today," "Prime English" and so on according to product.

Interchangeable Tickets: This type of ticket is produced in many different styles and designs. All allow the user to make up any desired price or wording from individual numerals and letters, which are then fitted into a purpose made holder.

The characters are usually either printed on to plastic or similar material, or moulded into actual shape. Holders are designed to meet almost any requirement. Variations of design cater for shelf pricing systems, free standing use or pegboard display.

Most price ticket systems of this type are sold in sets, but individual characters and holders are sold for replenishment purposes.

Card and Label Holders

The need for titling and labelling extends far beyond product display. Clear indication of names, materials, stock, contents, and other information is often required on shelving, fixtures, cupboards, drawers, files, books—in fact almost anything. Generally this is required in such a way that the information can be changed from time to time. One way of achieving this is by writing or typing the information on to paper or card, which is then inserted into a holder fixed to the article or fixture.

Channeling, similar to that used for shelf pricing systems in one method and is suitable for a variety of purposes. Card frames, usually of metal are suitable for drawers, cabinets, etc., and are obtainable with "pull" handles. Other types of card frame are suitable for shelf edges. Both are made in various sizes.

For a wider range of applications self-adhesive transparent plastic label holders are most useful. Usually sold in strip form in several widths, it is easily cut to the required size. It may be open at the top edge so that the card rests on the fold of the plastic, or side opening so that the card is inserted from either end. It is also made in the form of packets in which the card can be inserted only at the open end; this type is only available in specific sizes.

To facilitate typing insert cards are usually provided in perforated strip form and in colours for identification and other purposes.

Tape Embossing Machines

These enable users to make their own labels on simple hand-operated machines which they buy together with reels of continuous plastic self adhesive strip—usually $\frac{3}{8}$ in. or $\frac{1}{2}$ in. wide. Each machines has a dial and mechanism which can be made to emboss letters and figures on the tape in any order to form prices, words, numbers or messages of any kind. The machine will also sever the embossed strip ready for the protective backing to be removed so that the label can be affixed to whatever product, folder, door, shelf, etc., it has been designed to serve. The demand for replenishment tapes is considerable, and they are offered in a variety of colours.

IDENTIFIES

Example of Tape Embosser.

Signs

A sign can be defined as a visual aid for the purpose of advertising, informing, directing, or warning. Since almost any type of material or method of reproducing the wording can be used, sign production generally covers a very extensive field, involving many different trades. This section, however, will only cover a limited number of signs and of the variety most likely to be of interest to the stationer.

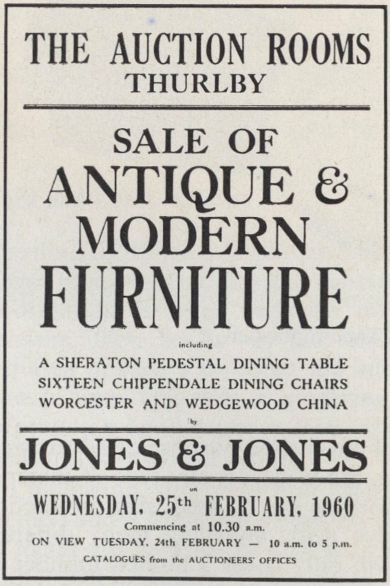
Posters

Posters are normally required for pinning or pasting to a surface for display. A special paper called Machine Glazed Poster is used and this has a smooth top surface for printing and a rough unfinished reverse side for pasting.

Sizes: Where standard bill boards are not involved, posters can be produced to any size, suitable for the intended location. Sizes of Crown (15 in. × 20 in.), Demy ($17\frac{1}{2}$ in. × $22\frac{1}{2}$ in.) and Royal (20 in. × 25 in.) are commonly used, and smaller sizes for window bills, streamers, etc. The latter should be of dimensions that will cut economically from a standard size sheet.

Where a poster is to be used on a street sited standard bill board, it must conform to the size of the board. Extra large posters are printed in multi sheet sections of standard sizes, for production purposes and ease of handling. They are then assembled on site. This type of poster, however, is not normally within the province of the stationer.

Printing: The number of copies required will generally indicate if the work can economically be carried out by hand. Usually this is up to about 15–20 copies, but where there is any doubt, advice or comparative estimates should be sought. When the quanity is suitable for a printing process to be employed, the following factors have to be considered.



THE AUCTION ROOMS
THURLBY

SALE OF
ANTIQUE &
MODERN
FURNITURE
including
A SHERATON PEDESTAL DINING TABLE
SIXTEEN CHIPPENDALE DINING CHAIRS
WORCESTER AND WEDGEWOOD CHINA
by
JONES & JONES
on
WEDNESDAY, 25th FEBRUARY, 1960
Commencing at 10.30 a.m.
ON VIEW TUESDAY, 24th FEBRUARY — 10 a.m. to 5 p.m.
CATALOGUES from the AUCTIONEERS' OFFICES

Typical Auctioneer's Poster
Produced by Letterpress.

Lettering Only: Here the work may be printed letterpress by a local printer having a supply of wood letters, and large sizes of suitable metal types. In this case the letter styles will be mainly conventional and special lettering effects difficult to obtain. Posters printed in this way are widely used by Auctioneers, Estate Agents, Cinemas, Theatres, etc.

Lettering and Illustrations: Letterpress is not a suitable process for large illustrations and the choice must be either screen or lithographic printing. The decision will be determined by the length of run and the characteristics of the illustration.

Silk screening is unequalled for producing rich solid colours in line illustrations but has limitations on photographic (half-tone) type of illustration and length of run. Lithography is the most suitable for a large number of fully illustrated posters. Drawn or conventional lettering styles can be used freely and illustrations can be line or half tone as required. As a rough guide, 50 to 1,000 posters are suitable for screening; 1,000 and above for lithography, but again professional advice should be obtained.

Colour: Although colour in itself is not a problem, it should be noted that each colour involved, will normally mean a separate working on the printing machine. Unless three or four colour illustrations are required, very effective displays using two colours only can be achieved by careful disposition of the colours; using areas of tint; overprinting transparent coloured inks to obtain a third colour effect.

If the poster is to be on display for some months it will be necesssry to use good quality, fast coloured inks to minimize fading.

Stock Posters and Window Bills: There are stock ranges of partly printed poster blanks, suitable for most attractions, such as flower shows, dances, fetes, etc., that can be overprinted with the required wording to make an attractive poster at an economical price. It should be remembered when preparing copy, that the less amount of wording allows more scope for the printer to display the copy matter with clarity and impact.

To meet requirements of local commerce there are also ranges of fully printed posters and window bills. Examples are property notices such as "House for Sale," "Let," "Sold," etc.; shop notices such as "Sale," "Sale now on," etc.

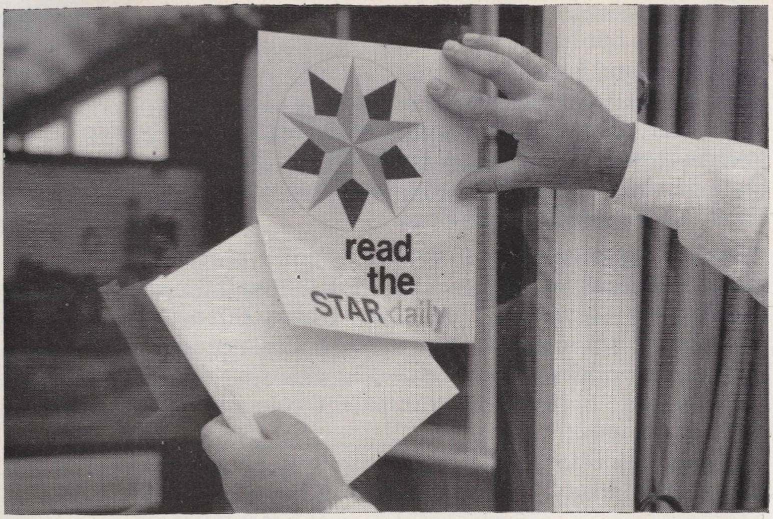
Window Stickers

Although the name suggests a particular application, these can in fact be used on many surfaces and objects for a variety of purposes. The materials include paper, plastics, acetates and foils.

Size and Shape: There is practically no limit to size or shape, both of which are governed by the use, location and smount of wording or other matter.

Printing: This can be of any design, from type or blocks, in any colour, line or half tone. Transparent materials can be printed in reverse so that the surface protects the ink and adhesive, making them ideal for outdoor use.

Fixing: This can be by strip gumming, but a peelable or permanent self adhesive backing is more often used. This can be applied to the face or back of the sticker. A P.V.C. material can be "self clinging" requiring no adhesive.



Window Sticker.

Stock Stickers: Although this type of sign is mostly made to order, there are some stock varieties. Examples of these are words as used by car dealers such as "Car Hire," "Cash Price," various car names, etc.

Showcards

Showcards are used for a variety of purposes and are normally required either for free standing use or hanging. The materials used include strawboard, chipboard, pulp and paste boards in many thicknesses. Selection is influenced by the size and purpose of the showcard and method in which it is to be displayed.

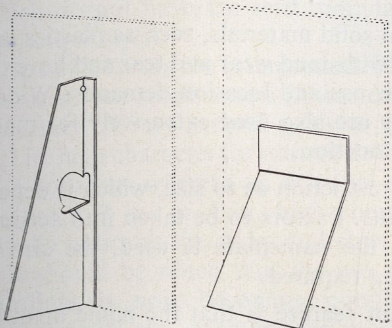
Size: There is no special size range and they are consequently made to any desired size according to purpose and location. Some showcards incorporate novelty display devices. All must be purpose planned to suit the need, product and location.

Printing: The card may be handwritten or printed and the factors to be considered are similar to those outlined for posters.

The greater percentage of showcards are printed on boards, or paper which is then mounted to a board, thinner substances being more easily passed through a printing press.

Methods of Fixing: After printing, the cards if they are to be hung, are eyeletted and strung, or fitted with hangers.

For free standing use, the heavier type of showcard can be fitted with struts. There are two main varieties. The lock rudder strut consists of a board, creased and punched, so that when glued into position on the back of the card, a supporting portion, *i.e.*, the rudder, is bent at right angles and locked into position. The base of the rudder is cut to enable the showcard to lean back at a safe angle.



Lock and Rudder Strut and Easel Strut.

The other variety is termed the easel strut. Part of this is attached to the showcard, and the other portion opens to the rear, on the same principle as the school easel. Both types often include a hanger for alternative suspension.

Varnishing, etc.: Showcards can be protected by varnishing or laminating, although obviously this adds to cost. Varnishes used vary widely between oil, spirit, synthetic lacquers and varnishes, each having certain characteristics. Some are non-rub, grease and water resistant, whilst others resist folding or abrasive action. They are applied by roller action in special machines equipped with infra-red drying tents.

Laminates provide added depth and greater brilliance than varnish. They include cellulose acetate, polyester and polypropylene film. They are selected according to the suitability of their characteristics and cost almost twice the price of an expensive varnish. Laminating film is applied by special machines using polyvinyl adhesives.

Showcards can also be backed with metal and although this too, increases the cost, they will last considerably longer.

Special Shapes and Assemblies: Showcards with irregular profiles are cut with specially shaped knives in a fly press which applies lateral pressure. Special assemblies incorporating commodity racks etc. are then run through a cutting and creasing machine. This type of showcard is, of course, delivered flat and assembled on site.

Stock Showcards: Ranges of part printed showcard blanks are available in various sizes and shapes for overprinting or completing by hand. These are printed in arresting designs and colours. The most popular wording is undoubtedly "Sale," "Special Offer," etc.

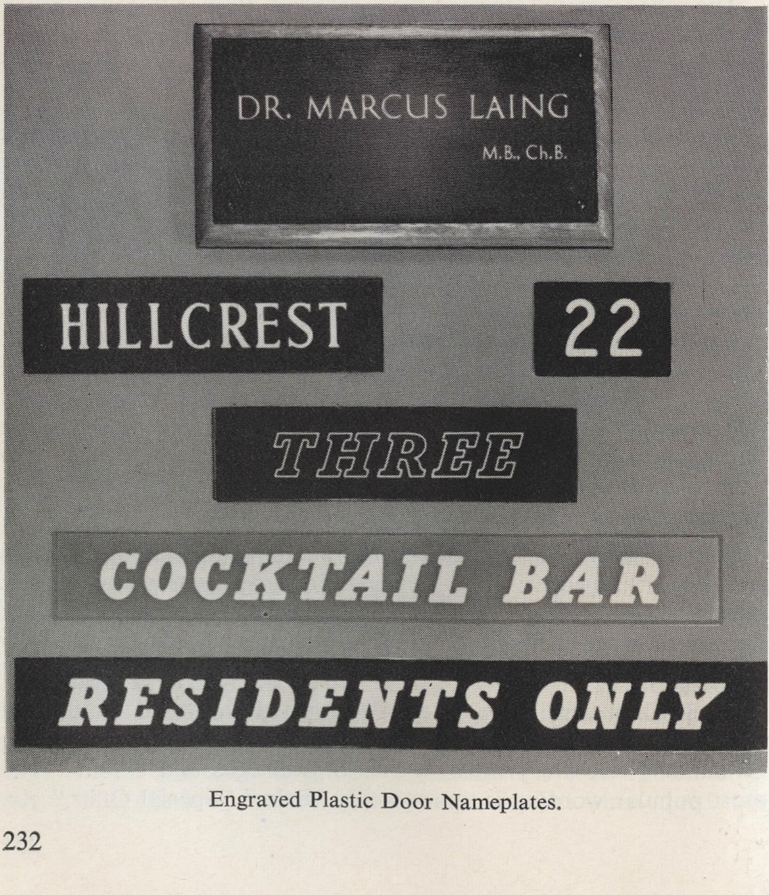
There are also ranges of fully printed cards suitable for general display purposes by local shops, restaurants, hotels, etc. Others are available to cover almost every general requirement in the office, shop, factory warehouse, etc.

Nameplate Signs

Nameplate signs are made from solid materials, such as plastics and metals, which will more readily withstand wear and tear and have the degree of permanency that their use and location demands. Widely used as door nameplates, they are also used extensively for many other purposes, in any desired location.

Size: There is practically no restriction as to size, which is dependent upon the users requirements. Factors to be taken into account include the location in which the nameplate is used, the size of lettering and amount of wording required.

Lettering: The most important feature is that the name or other information is clear and can easily be read. It therefore follows that



Engraved Plastic Door Nameplates.

lettering design plays an important part in nameplate production. Standard type styles are principally employed, and broadly speaking these fall into two main groups. "Serif" styles are those in which the strokes of the letter terminate with a crossline or serif, popular examples being Roman type styles. "Sans Serif" are those styles which do not have the serif, popular examples being Gill Sans or Grotesque styles.

Size of lettering too is important. Mostly capital letters (upper case) are used, but small letters (lower case) are used where required or necessary. A very general guide to size would be the use of a ¾ in. or 1 in. high character for normal door nameplates—used for example in a corridor; whereas an exit sign at the end of a corridor would require a 3 in. or 4 in. high character. Manufacturers literature usually indicates the styles and sizes available.

It should be noted that the use of symbols to illustrate certain wordings is now becoming popular. Specially drawn lettering, crests, motifs, etc., of course cost more than standard styles, but most manufacturers will submit drawings, designs, prices, etc., on request.

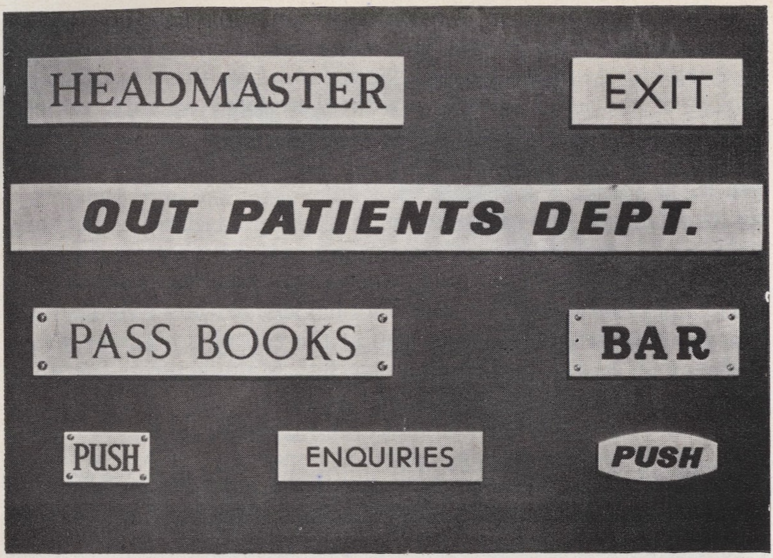
Materials: A variety of materials can be used, but mostly they are either metal or plastic. The former are more expensive and include brass, bronze, stainless steel and aluminium.

Coloured and clear plastics are very popular and less costly. Apart from being decorative they have the added advantage of weathering well, with little or no maintenance. A bronze plastic is the modern counterpart to bronze metal.

Reproduction: Although plate signs can, according to material, be hand painted or hand engraved, those traditionally sold by the stationer are usually reproduced by mechanical means.

Machine engraving is used extensively for singles, or quantities. The lettering is reproduced from master templates by means of a pantograph. The lettering is then filled with black engravers wax in the case of brass and stainless steel; a coloured vitreous enamel for bronze; cellulose colours for aluminium; enamel colours for plastics. The metals can be polished or sateen finished. Bronze is usually oxidized to a sepia colour and aluminium is usually self colour anodized.

Plastic materials can be heat stamped or blocked. The process requires a die and blocking foil or film, which is surfaced with a colour. The foil is placed over the blocking area, and the die is applied under pressure and heat, both of which are critical factors for good reproduction. The die also needs to be deeply cut for a good impression; for short runs by machine it is usually made from brass; for long runs, steel. Singles, or very small quantities, can be blocked by hand, using a hand tool, usually of brass. In certain circumstances a printers stereo can be used. This process is suitable



Engraved Aluminium Door Nameplates.

only for small areas of blocking and the surface of the material must be true.

Certain printing processes, notably screen, offset and lithography, can also be used, but they are only suitable for quantity production, and there are limiting factors in respect of the thickness of material that can be passed through the printing press. Other considerations are similar to those mentioned under poster and showcard production.

For producing nameplate signs with the lettering in relief, other methods are employed. Cut out or moulded characters can be adhered to a surface and a variety of materials can be used for this effect.

Metals, notably bronze and aluminium, can be die cast; that is formed in a mould. Any part of the design can then be stove enamelled in colour for effect. Similarly, aluminium can be die pressed; in this method the sign is pressed out of the metal by a die under heavy pressure.

Sign production extends to business and professional plates, directional panels, commemorative plaques and tablets, illuminated signs, facias, etc. However, these are not usually within the province of the stationer.

Fixing: The majority of plate signs are fixed by means of screws. Where required for suspension, or free standing use, the manufacturer is able to produce accordingly. For some purposes, such as desk use, or multiple door nameplates, the sign is often mounted on a wooden block. More elaborate business plates may require a concealed fixing. This is normally effected by means of tapped bosses or holes on the reverse side.

Stock Nameplates: Of necessity, many nameplates are specially produced. There are, however, ranges of signs in various materials, sizes, styles, produced by most reproduction methods, to suit almost every requirement and need, for commercial and private use. These commence with single characters that enable the user to make up their own wording, or to use for a particular purpose, and extend to a considerable selection of popular words and wording.

Notice Boards

Notice boards are used as a means of displaying easily, valued information of a concise nature. They are produced in many forms according to the application, and are used in shops, showrooms, hotels, foyers, entrance halls, and the like.

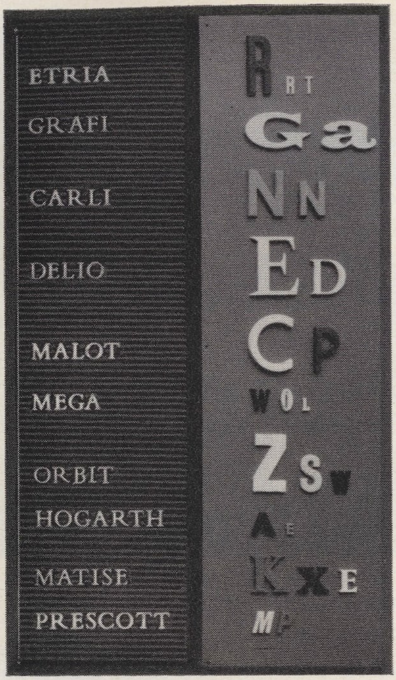
Size and Lettering: These considerations are mainly dependent upon the location, coupled with the amount of wording likely to be required. Size and clarity of lettering is particularly important, since the objective is to present the information in such a manner that it can be quickly noticed and absorbed.

Materials: Wood, metal and plastic materials are used, and they are usually of a framed construction, with a background according to the type of board.

Static Boards: As the name implies, these remain in one position, the information remaining current for some period of time. They are usually sign written, although a more modern method would be the use of a decorative back panel of plastic, on to which cut out or moulded lettering is adhered.

Changeable Boards: The important feature of this type of board, is that information can be changed rapidly and without difficulty whenever so desired. Basically this is achieved by a back panel, designed so that lettering can be fixed to it, but easily removed. Some types have a slotted panel—usually felt covered and lettering that is flanged so that it is gripped by the slots. Another form is a rubber slotted panel to take similar lettering. Pegboard can also be used with specially made lettering. Other forms include channelled boards into which the lettering is inserted from the side; smooth surfaced boards for pressure sensitive lettering; magnetic boards and lettering.

Used in a different way is the felt covered notice board on which notices are pinned. The background must be of a material that will accept pins without difficulty. Hardboard, or a cork lined board is often used for this type.



Examples of Changeable Lettering, and Fixed Relief Lettering.

Extras: Notice boards are sometimes required with a headboard or "pediment" which is signwritten to order. When used in public locations it is advisable to incorporate the board in a glazed cabinet fitted with a lock, to prevent tampering. This is particularly important in the case of changeable boards.

Fixing: Basic methods of fixing are for wall or free standing use, but any desired fixing can usually be accommodated.

Stock Notice Boards: Static boards are normally purpose made. Changeable boards are available in a range of sizes, together with sets of characters. There are also many display boards, with ranges of made up woods for use as menu and price boards etc.

9. Office Accessories

Desk Accessories

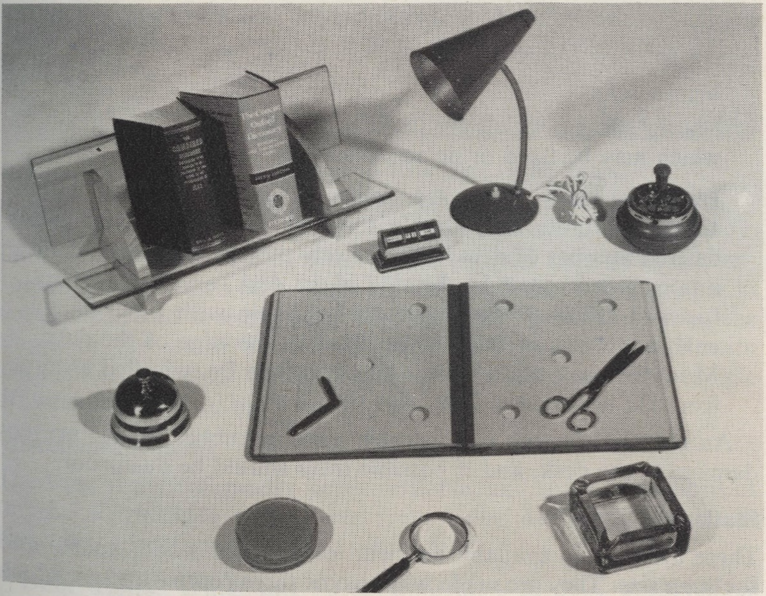
The modern desk is the main item of furniture in the office and is very often a status symbol of the user. As a result the number of accessories found on the desk will depend on the whims of the user as well as on the actual need. For executives, care should be taken in the selection of items required, as the need may well be a question of taste and the matching qualities of the various items. For the more general needs of clerks, typists, secretaries, etc., the importance is likely to be directed more to the functional aspect. It is quite impossible to detail every single item, and some that could be classified under this heading, such as writing instruments, perforators, staples, etc., are dealt with in other sections of this book. The following therefore is a survey of the more important items, but reference to some of the excellent catalogues of stationery sundries will show the many other items available.

Blotting Pads

These are made in three basic sizes:—

$8\frac{3}{4}$ in. × $11\frac{3}{4}$ in. (demy quarto),
$11\frac{1}{4}$ in. × $17\frac{1}{2}$ in. (demy folio),
$17\frac{1}{2}$ in. × $22\frac{1}{2}$ in. (demy flat).

Demy is the principal size of blotting paper, and sizes of pads other than those mentioned may therefore well result in difficulty in obtaining the appropriate size of blotting paper. Cheaper qualities are made with rexine or plastic corners, whilst in the dearer price range leather is used. Some have strips of material at the left and right edge of the pad; this style is called "military ends." An essential feature is a good, stout, non-warping base that will lie perfectly flat on the desk.



Examples of Desk Accessories.

Other types are fitted with "wings" or "flaps." These flaps are hinged to each side of the pad and fold over to the middle. Such flaps can also be made to hold engagement and memorandum pads for use when the flaps are opened out, and also can be padded on the top side to give a more luxurious appearance.

Signature Blotters

Sometimes called "correspondence" blotters, these are sheets of stout blotting bound into a cover, or made in refillable style, as the leaves will in due course become soiled or torn. Completed letters or documents are inserted in between the leaves ready for signature. Holes are punched in the leaves so as to enable the typist to see that all documents have been extracted. Sizes are usually quarto and foolscap.

Rocker Blotters

To a large extent these have been superseded by signature blotters, but they still serve a useful purpose. They consist of a curved base on to which strips of blotting can be fitted. This is surmounted with a handle and enables the user to "rock" the blotter over the wet ink.

Letter Trays

Letter or correspondence trays of various types essential for keeping documents tidy. They are obtainable in wire mesh (which can be enamelled or coated with plastic), metal, plastic and polished wood. The size is mainly foolscap, but the depth can vary. They can be classified into three groups:—

Single trays.

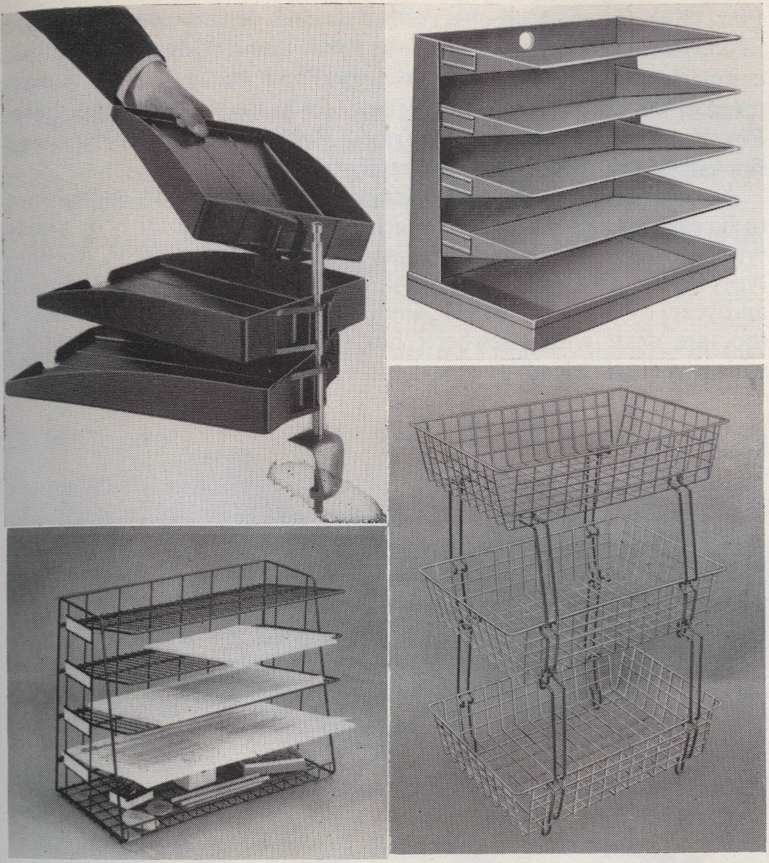
Multiple trays, which are upright sets of two or more trays, which may be fixed or detachable.

Extending trays. These are similar to single trays, but with additional units that enable them to be built up to any desired number of tiers. Alternatively they may be fitted with a floor stand to use by the side of the desk, or with brackets for wall fixing. Other types are available with brackets to enable the tray or trays to be fitted to the edge of the desk. Mounted on a central pivot they can then be swivelled away from the desk top.

An essential feature is a smooth base, or rubber feet to prevent damage to the desk, and if possible trays should be dustproof.

Stationery Racks

These are usually available in metal or polished wood, quarto and foolscap size. They are made with two or three compartments, which are also divided to accommodate letterheadings, envelopes, etc.



Examples of Multiple and Extending Letter Trays.

Stationery Cabinets

These consist of 3, 4, 5 or 6 drawers fitted into an overall cabinet. Sometimes described as a "nest of drawers," they are available in both quarto and foolscap sizes, and made to open either along the length or the width. Materials used can be wood covered with leatherette, polished wood, plastic or metal. Sometimes single drawers are made to build up into any desired number of tiers.

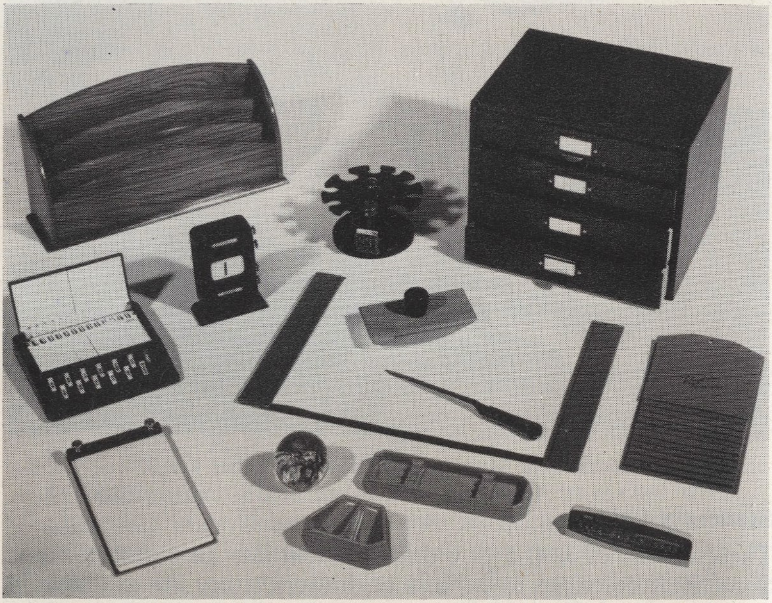
Miscellaneous Items

The wide variety of sundry items available, and space limitations of this book, preclude these items from being dealt with in detail. However, a brief mention must be made.

Desk Tidies: While this name sometimes denotes a particular article, it does in fact refer to a number of similarly related articles.

Pins, clips, fasteners, books, rubber stamps, pencils and the like are in constant use and require to be at hand. Items of single or multiple compartments, with or without covers, and made from an assortment of materials, in various designs, are available for this purpose. **Pin Bowls, Pen and Pencil Trays, Rubber Stamp Holders** and **Bookstands** all serve these requirements.

An **Ash Tray** is an essential item and should be heavy enough not to be easily upset. **Calendars**, which can be of the monthly or yearly type, are dealt with under the chapter on social stationery. Another type, known as "perpetual," enables the user to alter the date, month and year, by means of wheels, knobs and other devices. **Pen Stands,** too, are dealt with elsewhere, but sometimes they are combined with perpetual calendars as a single unit.



Examples of Desk Accessories.

Message Pads are a useful addition. The base should be non-slip as so often they are used with one hand. It is preferable for them to be refillable.

Most desks are equipped with telephones, and consequently a **Telephone Index** is necessary. This may be of the "flap type," which consists of a "bank" of leaves showing each letter of the alphabet at a glance. Or it may be automatic. Here, by the positioning of a slide or other device and the pressing of a bar, the cover opens to the desired letter of the alphabet.

Other items include **Paper Knives** (or **Envelope Openers**) to facilitate the opening of letters, **Scissors**, **Penknives**, **Reading** or **Magnifying Glasses**, **Paper Weights** and so on.

Matching Sets: Many of the items mentioned are made to match, although the items can be bought separately. Various qualities, grains and colours of leather are obtainable, which may also be blind, embossed or decorated with designs in gold.

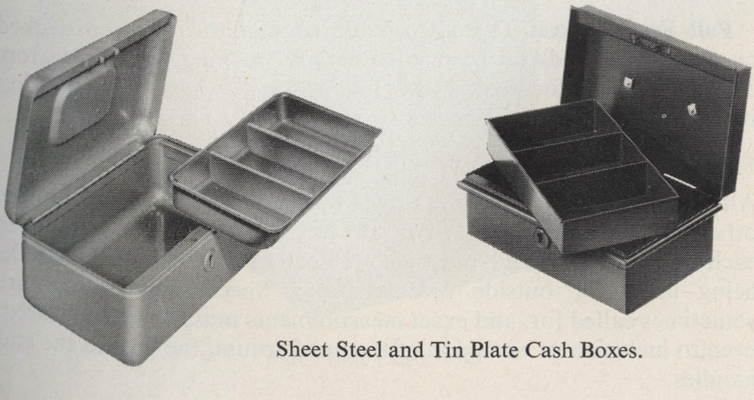
Desk Lamps: Although left until last, these articles are becoming very popular, and are often sold by the stationer. They need to be of the flexible or adjustable type, suitable for normal voltage. The base should be heavy enough to prevent the lamp from being knocked over. Some models have a clamp base for fitting to the edge of the desk.

Cash Boxes

Generally speaking, these can be divided into two basic grades:—

> Those made from **tin plate** which, when shaped, are sealed at the seams by soldering or welding. They are light in weight and less expensive in price than the next grade. Locks are usually of the tumbler and two or four lever type, with little or no variation in key variety.
>
> Those made from **solid drawn sheet steel** without seams. These are of heavier and more solid construction, and are comparatively more expensive. The quality of the lock can vary from the cheapest to the best, and will often be available with a variation in key patterns. This type of box is designed to give a greater measure of security. Specialist manufacturers also produce a fire-resistant quality.

All types may include a partitioned tray, with or without lids, for coins. In the main, these are made to lift out, but in some models



Sheet Steel and Tin Plate Cash Boxes.

the coin tray is fitted so that it lifts out of the box automatically when the lid is open.

The finishing colours will be dependent on quality and manufacturer. The usual size range is 8 in. to 14 in., with 10 in. and 12 in. being the more popular, as often the box is kept in a safe, or other secure place, which determines the size required.

It is not usual for this type of box to be made specially but, if inquiries are made, then standard measurements must be adhered to as all qualities are made from special tools with a minimum of hand labour.

Deed and Document Boxes

The majority are made from varying qualities of sheet steel with welded seams, though some are now being made from deep drawn seamless steel, but these are in the shallow variety. Locks can be of the two or four lever or Yale type. Usually the finish is black japanning or grey hammer finish, but it can vary with manufacturer. This type of box can be classified into several types as follows:—

Shallow Boxes: These are available from 10 in. to 18 in. in length and are so called because of the depth, which varies from approximately 3 in. to 6 in. The width, of course, would be in proportion to the length.

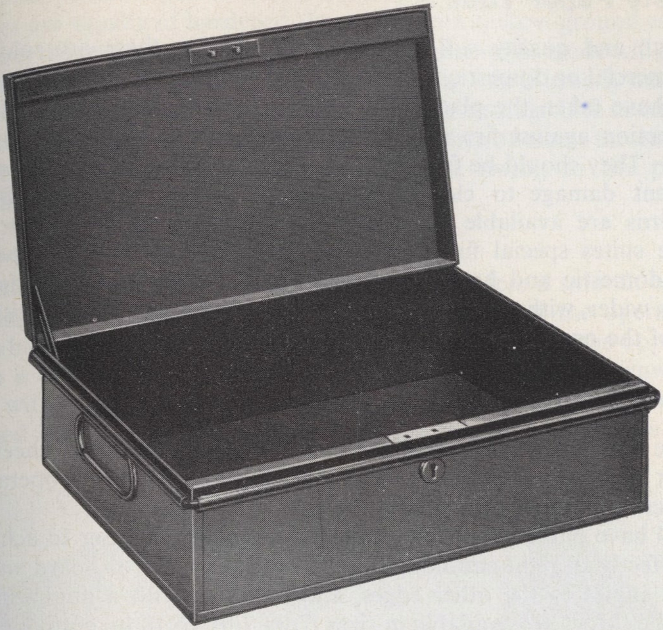
Deep Boxes: These are available from 12 in. to 24 in. in length, sometimes larger. Again, these are so called because of their depth, which varies from approximately 6 in. to 18 in., with the width in proportion to the length.

Household Boxes: These can either be "shallow"—approximately 3 in. deep—or "deep"—approximately 6 in. deep. The length varies from 12 in. to 16 in. but the width is only half that of the two former types, as they are designed to keep documents in their folded state rather than flat.

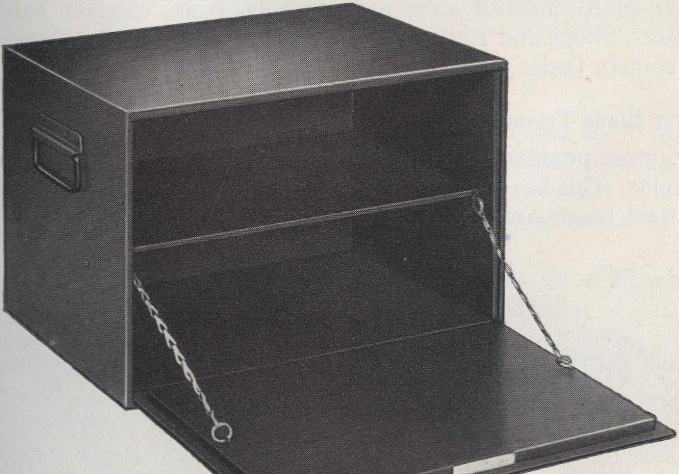
Fall Front Boxes: These are made so that they can be stacked on each other and can be opened without moving the box on top. The front opens forward, and is retained in the horizontal position by two chains or stays.

Sizes

Although most manufacturers refer to sizes as 10 in. or 12 in., the other measurements of the box are not necessarily the same with each manufacturer. One must also remember to question the size as being inside or outside measurements. Special-sized boxes are sometimes called for, and exact measurements must be clearly stated, even to inclusion or exclusion of the bead around the lid and the end handles.



Shallow Deed Box.



Fall Front Deed Box.

Waste Paper Tubs

Design and quality will depend upon whether these are sold for commercial or domestic use. The former are usually made from steel and have taken the place of the wicker basket, as they offer some protection against fire if a match or cigarette is carelessly thrown away. They should be free of sharp edges or rough corners, so as to prevent damage to clothes, particularly ladies' stockings. Some patterns are available in other materials, such as plastic, or for office suites special finishes are available for matching purposes. For domestic and hotel use the variety of material and design is much wider, with a greater degree of colour, and with the diminishing use of the open fire demand is steadily increasing.

Paper Trimmers

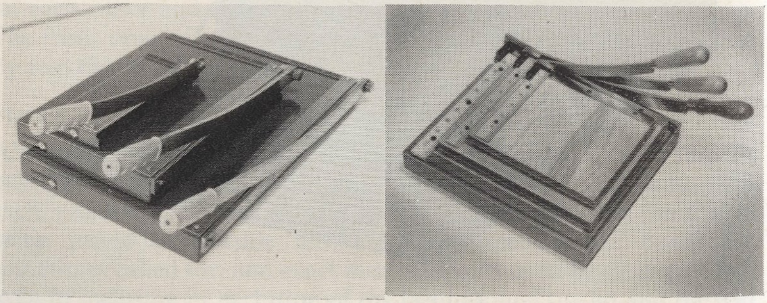
There are three main types of trimmer for cutting individual sheets of paper or board (as distinct from guillotines, often power-operated, that cut a number of sheets at once).

All have one end in view—namely, to enable the user to achieve a perfectly straight cut along one edge of the paper or board and at right angles to the other edges, and to do so with a minimum of trouble. Most are available in sizes from 7 in. to 18 in. cutting edge.

It should be noted that the regulations covering the use of trimmers and guillotines in an office or other establishment where several people might use it put the onus on the *user* to provide an adequate finger-guard against accidents resulting from careless handling (Offices, Shops and Railway Premises Act 1963, and the Dangerous Machinery Order 1964).

Lever Blade Trimmers

The most popular and the least expensive type is the lever blade trimmer. This has one steel blade fixed along the edge of a wooden or steel baseboard provided with a squaring guide and a second

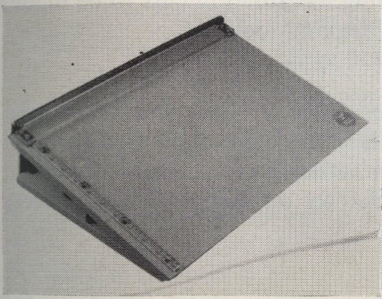


Lever Blade Trimmers with Metal and Wooden Base.

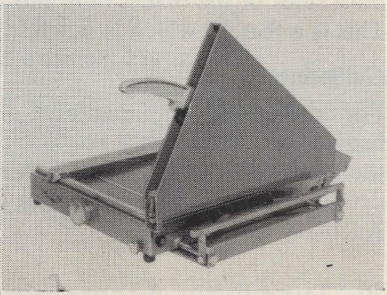
movable blade hinged to it by means of a spring-loaded bolt. Both blades are usually of hardened shear steel with hollow-ground edges, and cut the paper with a scissors action. The movable blade will have a handle attached to its free end. The squaring rule is usually marked in inches or centimetres to facilitate accurate cutting. It is necessary to hold the paper with one hand while the other operates the cutting blade, otherwise a curved cut could result owing to the paper moving.

Desk Trimmers

Another type of trimmer is the desk trimmer. Here a smooth board is hinged to a stout base at its front edge (nearest the operator). This board is spring-loaded in an upwards direction. At the opposite edge a cutting blade is mounted with its ground edge downwards and with a gap of about one eighth of an inch between it and the hinged board. A second cutting blade, sharply angled with its high side at the left, is hinged to the base and is pressed by a spring against the top blade. When a piece of paper is pushed through the gap and the top board is pressed down a clean cut results. The top board is prevented from rising too far by a stop attached to the lower blade.



Desk Trimmer.



Office Cutter.

Refinements to the desk trimmer include a plastic guide under which the paper is slid. This is engraved with a number of parallel lines to facilitate lining up the cut with, say, a margin of type or the edge of a photographic image.

There is usually a squaring rule marked in inches or centimetres to the left of the top board, and an adjustment to this is provided to ensure an absolutely square cut. It would be almost impossible to cut oneself on this type of machine and, if a large number of sheets have to be cut, it is quicker to use. On the other hand, its use is limited to paper and thin card; thicker boards would have to be cut with the lever type.

Another type of paper trimmer has recently appeared in which a hardened steel disc moves down a guide rail and in contact with a fixed blade, but the cutting principle remains the same.

Trimmers are also made in which the cut is made by a "cropping action." Two accurately-aligned steel edges close over the paper and crop the edge off. This principle is also used in deckle edge trimmers, the cutting blades being ground in matched pairs.

Office Cutter Models

There is a considerable demand today from offices, works, drawing offices, schools, advertising agencies, etc., which require a heavier machine that allows 50/60 sheets of paper to be cut simultaneously. This type has a blade and counter-blade action, but also includes a spring-loaded clamping action. Models of this type are usually of all metal construction much more robust than the paper and desk trimmers, and the movable blade is always fully enclosed in a guard. Some of these models also incorporate a measured scale on both sides of the blade, thus allowing measured offcuts to be made. This is a feature which is much in demand today.

Guillotines

For cutting and trimming large quantities of paper and board even heavier type models are needed. These are quite easily sold through the stationer, but, in view of their rather more specialist function, details will be found under the chapter on Reproduction Process Ancillary Equipment.

10. Typewriter Accessories

The typewriter is the most widely used office machine. Moreover, the portable version is used by an ever-increasing number of people for private, professional and semi-business purposes. As a result, a considerable number of products are sold, either to use with the machine or to assist in its day-to-day maintenance. The items first in importance are typewriting papers, envelopes, carbons and ribbons. *These are dealt with in detail in other chapters*, but it is desirable to include a brief reference in this section.

Typewriting Papers

In the usually accepted sense these are bond and bank papers of varying qualities and substances (or weights). According to the customer's requirements other papers are used, but the essential features of any paper used for typewriting are that they should have a surface that prevents smearing and also be suitable for writing upon.

Bond papers are used in the main for the original document. These are of heavier substance, the most popular being 15 lb., 18 lb. and 21 lb. large post (61, 73 and 85 gsm.). Bank papers are generally used for taking the carbon copies as they are cheaper and lighter in substance, the most popular being 11 lb. large post (45 gsm.). For airmail purposes and multi-copy manifolding, papers of an even lighter substance are required, usually around 7–8 lb. large post (29–33 gsm.). Both classes are available in white and a range of colours.

Confusion often arises in selling these papers, as any paper the customer uses is naturally referred to as a typewriting paper. The assistant, therefore, must determine the customer's requirements by question and answer, or preferably by the showing of samples of paper held in stock. When "copy" paper or "flimsy" is asked for, it can safely be assumed that a bank type paper is required. The principal sizes in both bonds and banks are:—

inches		mm.
8 × 5	Large post octavo	203 × 127
8 × 6½	Large post sixmo	203 × 165
10 × 8	Large post quarto	254 × 203
13 × 8	Foolscap single	330 × 203
8¼ × 5⅞	International A5	210 × 148
11¾ × 8¼	International A4	297 × 210

A smaller demand exists for 16 in. × 10 in., known as "draft," and 16 in. × 13 in., known as "brief." All are sold in packets of 1 ream (500 sheets) although 8 in. × 5 in., 8 in. × 6½ in. and 8¼ in. × 5⅞ in. are often in 2 reams, so that the same sized carton as is used for 10 in. × 8 in., 13 in. × 8 in. and 11¾ in. × 8¼ in. can be used. The term "cut ream" is used to distinguish the quantity from a ream of the standard size sheet (*e.g.*, large post) from which the sub-divisions are cut. To meet the needs of the smaller user, convenient quantities are sold either in packets of 1 quire (24 sheets) or in such a quantity as will enable it to be sold at a specific price.

Business firms are usually very particular about the make, quality and colour of their typewriting paper. Often it is required to be headed with their name, address, etc. by one or other of the printing processes. While some are satisfied with standard type set styles and layouts, others will require specially designed letterheads, and the inclusion of emblems, trade marks, etc., in specified colours to match a particular "house" style.

Envelopes

Complimentary to the use of typewriting papers for correspondence, envelopes are an important related product. The range is extremely wide and as a subject requires a separate chapter. However a few comments are necessary here, for the discerning user of typewriting paper is likely to be equally so in the choice of envelopes.

Most manufacturers make a range of envelopes to match their own quality of paper, in addition to which there are many other types and grades that meet almost every requirement. Papers generally used include bond, parchment and cartridge; cream and azure laid or wove; and manilla; all of which are available in varying substances. Some papers are less opaque than others and where opacity is important, envelopes can be obtained that are printed with an allover pattern on the inside, that make them completely opaque. As with paper, envelopes may be required specially printed or diestamped on the face or flap.

The two main styles of envelope are "Banker," which have the flap and opening on the side having the greater dimension; and "Pocket" which have the flap and opening on the side having the lesser dimension. The order of the measurement for both types is established by stating the first measurement which is at right angles to the opening.

In addition to these main styles there are many variations in the shape and cut of the envelope, sealing and gumming methods, type of envelope and size. For business letters the most important sizes are:—

	British		*International*	
	in.	mm.	mm.	in.
Banker	3½ × 6	89 × 152	C6. 114 × 162	4½ × 6⅜
	4 × 9	102 × 229	DL. 110 × 220	4¼ × 8⅝
Pocket	9 × 4	229 × 102	DL. 220 × 110	8⅝ × 4¼

The legal profession also uses pocket envelopes 11 in. × 5 in. (279 × 127 mm.), 14 in. × 5⅛ in. (356 × 130 mm.) and 15 in. × 6 in. (381 × 152 mm.). These are sometimes called draft, brief and extra draft respectively.

There are a number of postal regulations concerning the use of, and posting of envelopes, which are detailed elsewhere. The latest concerns Post Office Preferred sizes (POP) which, in addition to effecting a degree of standardisation, will qualify them for a lower rate of postage.

Envelopes are boxed according to size, but for those mentioned above, quantities of 500 and 1,000 is normal and 250 for better qualities. Mostly they are banded 25s or 50s, which facilitates selling in small quantities.

Typewriter Carbon Papers

These are specially-prepared coated papers used between the original document and copy papers to produce the carbon copies. Again many qualities and weights are available. The choice of weight is dependent upon the number of copies to be taken at one typing; for example, a lightweight carbon is needed for taking six to eight copies, whereas a heavyweight is used for taking one or two copies. Good-quality carbons are durable and will yield a large number of clear, sharp copies. They are clean to handle, do not smudge the copy paper and should not slip or curl. The best qualities have a plastic coating on the back to prevent slipping and curling, to facilitate easy handling and to increase strength. The latest type of carbon paper is the "waxless" or "solvent" carbons; these have a special ink-impregnated coating instead of the usual wax pigment coating. They have outstanding wearing qualities and are exceptionally clean. The sizes match those of the typewriting papers, but the packing is invariably in boxes of 200 sheets, although boxes of 100 are available. Smaller packets, too, can be obtained for the small user. Various colours are made, but black is by far the most popular, with blue, purple, red and green having less and varying demand.

Re-ordering details are printed on the box, and these should always be stated when re-ordering to ensure that the correct make and quality is supplied.

Typewriter Ribbons

These are mostly made of inked fabrics which may be cotton, silk, or nylon. For electric typewriters a plastic carbon-coated ribbon is also available and is used where appearance of correspondence is of the maximum importance and for reproduction work.

Irrespective of the fabric used, they may be single or two colour, with black or black and red record being the most popular. Other colours are obtainable so that the user can match the typewriting with the colour used in the letterheading or for any other special requirements.

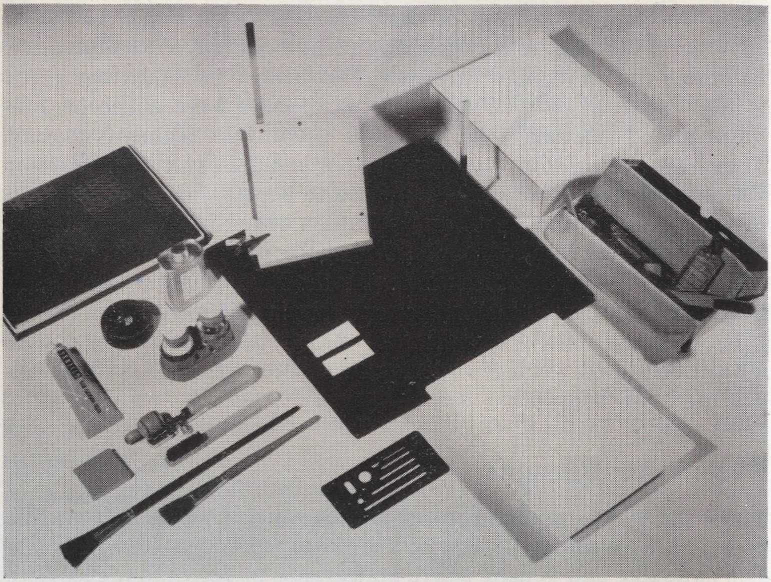
The degree of inking also varies from light to medium and heavy and even intermediate grades. Special inkings on fabric ribbons are required for certain applications, but these are dealt with in a more advanced chapter.

The ribbon, which can be of different widths and lengths, is wound on to spools the size of which also varies with the make of machine. In order that the correct ribbon for any particular make of typewriter is easily determined, suppliers have now grouped machines taking the same ribbon spools, coding each group with a letter or number. In this way the number of different spools has been reduced to manageable proportions. Charts listing the various groups of typewriters are available from the manufacturers. When ordering ribbons it is very important to furnish the supplier with all the necessary details; these are normally printed on the ribbon container.

Typewriter Sundries

Items in this group include:

Erasers: These have already been referred to under erasers generally.



A selection of Typewriter Accessories.

Erasing Shields: These are used to facilitate the use of a typewriter eraser. Made of thin plastic or metal, with differently shaped "cut-outs," rather like a stencil, the shield is placed over the incorrect word or letter. The typist is then able to use the eraser without spoiling any of the remaining copy. As these shields are thin, they can be used while the document remains in the machine.

Correction Paper: This is a more modern method of correcting errors. It is chemically treated and is placed over the error; the error is then typed again so that it receives a white coating which blanks it out. The correction is then typed. Different types of correction paper are normally needed for the original and the carbon copy.

Correction Fluid: This is applied over the error and, when dry, the correction can be typed.

Backing Sheets: These are used to place behind the paper in the machine in order to improve the quality of the copy by preventing the platen from absorbing some of the force of the typewriter key. They also assist the typist in feeding several sheets into the typewriter as they have a turnover flap at the top. These are made of thin plastic or thick paper.

Typewriter Mats: These have the effect of deadening some of the noise produced by typewriting, as well as providing a cushion base for the machine. In addition they also assist by providing a non-slip surface. Sizes vary, but on average are approximately 15 in. × 12 in., and the material may be felt, sorbo or rubber.

Copy Holders: These form a useful accessory, as they allow the typist's notebook or copy to rest in a naturally visible upright or angled position, thus ensuring the minimum of head movement for the typist.

Cleaning Materials: These are essential if the machine is to be kept in good condition. They consist of brushes, oil, dusters and typecleaners, all of which can be obtained separately or in complete cleaning outfits. The use of a typecleaner is necessary as the type key can easily be "filled in" with eraser dust, fluff, dirt, dried ink, etc.

Typewriter Covers: These are made in plastic, rexine or leathercloth. The machine should always be covered when not in use. Since there are many different sizes of machine, the make of machine, together with the length of the carriage, must always be stated.

11. Duplicating Accessories

Not so very long ago, reproduction by means of duplicating was looked upon as a messy and laborious method of producing copies. Today, the improvement in machines, materials and techniques have transformed duplicating into an effective, speedy and economic means of communication. There are a number of methods by which multiple copies can be produced, all of which are dealt with at some length in a later chapter. However, two methods, namely spirit and stencil duplicating, are widely used for private and business purposes, the materials and accessories for which are commonly stocked by most commercial stationers. While it is necessary to briefly describe the processes in order to explain the use of the accessories, *this section is only intended as an introduction to the subject.*

Spirit Method

With this process the image is written, drawn or typed on a "master" consisting of a sheet of one-sided chromo paper. The chromo or hard-coated surface of the master is in contact with a special hectograph carbon placed underneath with the carbon coating face upwards. Under pressure from the pencil or typewriter key, an image in reverse is transferred from the carbon paper to the shiny side of the master paper. The master is then fitted around the cylinder of the machine, the image side uppermost. In machining, the copy paper is moistened with spirit before passing between the cylinder and pressure roller; this causes a minute amount of colour from the carbon impressions to be transferred from the master, printing a positive image on the copies. One of the advantages of this method is that the master can be prepared from several different colours of hectograph carbons, all colours printing simultaneously in one run.

Master Paper

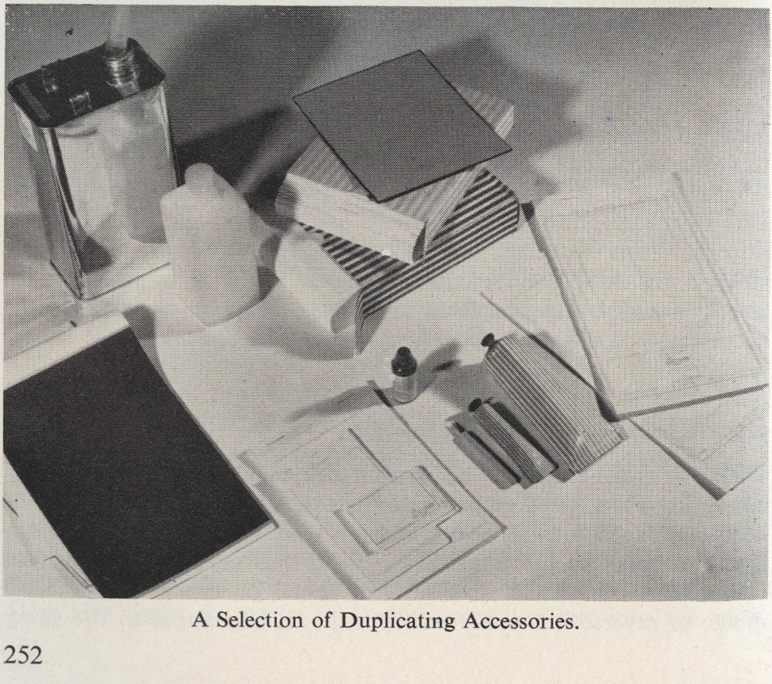
Chromo paper has a glazed or shiny surface on one side and is sold in sizes and quantities in just the same way as any other "cut papers".

Hectograph Carbon Paper

This is supplied in sizes, colours and quantities as for typewriter carbons. Each sheet of carbon is used once only; the number of copies to be run from the master will depend upon the grade of carbon used.

Master Sets

These are sets of master paper and hectograph carbon paper joined together ready for instant use, thus speeding production. They are



A Selection of Duplicating Accessories.

normally available in standard quarto and foolscap sizes, although special sizes can be made to order.

Hectograph Ribbons

Typewriters are available specially designed to take ribbons for preparing masters. These obviate the use of hectograph carbon sheets, as special hecto ribbons are used to produce the image. These are made up in reels approximately $\frac{5}{16}$ in. wide, from paper coated with the special hectograph transfer on one side. The master paper is inserted into the typewriter with the ribbon underneath the sheet, the ribbon moving from one spool to the other face upwards and being used once only.

Duplicating Paper

Unlike the stencil duplicating method, which follows, the spirit process does not require an absorbent run-off paper to facilitate the drying of the copies. This is achieved by the evaporation of the spirit, which requires a paper with a smooth surface for best results and to resist "bleeding" of the image. Special qualities are available in various colours. Sizes and packings are the same as those used for typewriting papers. Thin qualities of smooth surfaced boards are also used.

Stencil Method

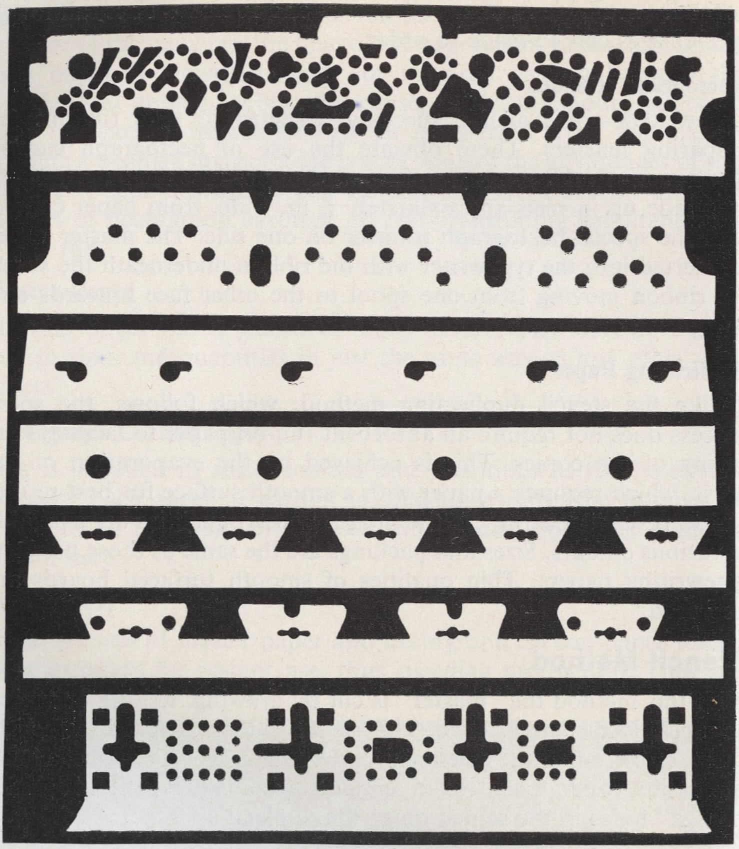
With this method the "master" is cut by drawing, writing or typing on a cellulose-coated stencil. This stencil is then fastened to the ink drum, or screen, of the machine. As the drum revolves against a hard impression roller, a controlled amount of ink is pressed through the "image" holes in the stencil on to the duplicating paper.

Stencils

As there are different makes and types of duplicator, so there are different grades and types of stencil. The method of fixing the stencil to the machine varies, so that a stencil for one make is not always suitable for another. It is, therefore, important that full particulars should be given, including the model of the machine for which they are intended. Alternatively, if this is not known, a sketch or sample of the stencil head should be submitted. Size, too, must be stated, as there are small sizes for flat menu duplicators and hand print pads, and foolscap or brief size for the larger machines; foolscap is the most popular size. They are sold in quires—*i.e.*, 24 stencils—and boxed in 1, 2 and 5 quires. A ream of stencils would be twenty quires.

Stencil Carbons

Each box of stencils contains a supply of single-sided stencil carbon which is included in the price. Before typing commences the carbon



Examples of Stencil Headings.

is placed underneath the stencil, face upwards. It assists to produce clear-cut and even characters, prevents the complete cutting out of letters and enables the typing to be read easily, because it shows up the letters in black. Various grades are obtainable to meet special circumstances, although a single-sided standard weight is suitable for normal requirements.

Correcting Fluid

This is supplied in small bottles fitted with a screw cap to which a small brush is attached. It is a volatile liquid coloured pink or white for normal use (and in black or orange for diapositive stencils). It is used for the correcting of mistakes when cutting the stencil.

Stylus and Wheel Pens

Various types are available for handwork on stencils. The stylus pens are used for writing or drawing and are made with different sizes of ball points, or they can be straight pointed. Wheel pens are used for ruling lines and are fitted with various kinds of cutting wheels to produce different line effects such as dotted lines, thin lines, dash-dot, broad and double lines, stave lines for music weiting and so on.

Writing Plates

When cutting stencils by hand it is necessary to use a writing plate. This is made from a stiff plastic sheet with a silk or nylon fabric fused on to one side. It is placed under the stencil, the fabric side providing a slightly rough surface which enables the stencil coating to be removed more effectively with the metal stylus. They are usually sold in quarto and foolscap sizes, but smaller sizes known as signature plates can be obtained. Another type of plate has a design moulded into the surface and is used to obtain shaded effects or outlines of well-known symbols. The cutting is performed with a special tool which is rubbed on the surface of the stencil over the plate.

Plastic Top Film Sheets

Although the use of high-grade stencils has reduced type filling to a minimum, some users prefer to have a sheet of plastic film placed over the stencil when typing as this eliminates completely any type filling. It is particularly useful if many stencils are being typed, as there is no need to stop for type cleaning. It also prevents the cutting out of complete letters. The material is thin but resilient, allowing the type to sink into the stencil, displacing the coating and suffering no damage by being cut itself. For this reason the stencil coating cannot penetrate the film and clog the type, and the film is serviceable for further use. Stencils can be obtained with the film attached, but this adds to the cost of the stencil; it is usually supplied in separate sheets, in quires of 24 sheets.

Inks

These are blended to suit the individual requirements of each type of duplicator and, because there are many different kinds of duplicator, it is essential for the correct grade of ink to be supplied. The manufacturers use different codes or reference numbers for identification, and it is not possible to compile a list covering all makes of ink. It is safer to refer to the lists which are supplied by the maker, as they are usually comprehensive and up to date. It is necessary to state the maker's name and the model number of the machine. If a reference number can be quoted from the ink container or box, this should also be included, but it is not wise to state a number alone unless one is absolutely certain of its meaning, as numbers can be misquoted or could be factory references which might not identify the exact grade. The colour, and whether quick drying, should also be stated.

Duplicating Paper

This is generally a fairly bulky, absorbent paper which will quickly absorb the ink from the stencil. Some qualities are only partly sized, which are suitable for writing upon, such as hand written signatures. Thin board is also used and has similar absorbent characteristics. Various qualities and colours are obtainable, in the usual cut sizes.

12. Packaging and Selling of Stationery Sundries

The introduction of this chapter stated that "Stationers Sundries" covered a bewildering range of merchandise. In the subsequent sections an attempt has been made to deal with the majority of the more important items by groups of related articles. Irrespective of whether this grouping has been of necessity, due to the use of the items, or purely for convenience, it should nevertheless serve to illustrate how wide and varied the range of sundries is. Similarly even a cursory glance through the sections should enable the reader to realize the importance of the range to customer and stationer alike.

The handling of this vast range demands some thought and planning if it is to be sold to advantage to all concerned. Until recently most sundry stock was often only looked upon as "oddments' and kept purely as a service, without any regard to the economies of its maintenance, or the possibilities of its contribution to sales and profits as a whole. Frequently stock comprised an ill assortment of unrelated items, kept in drawers or boxes in a haphazard manner, with no attempt at display and sold only at the expense of considerable time and effort. Some items, available in bulk quantity only, necessitated the breaking down of it into smaller quantities, with the attendant problems of pricing, broken boxes, or packets, which in turn results in untidy stock, often becoming dirty and unsaleable. This method of selling also presents problems to the assistant, as stock location, speed of service, knowledge of product, etc., is practically impossible.

Modern requirements of retailing and techniques in selling has meant an entirely new approach, with the result that today, the selling of so called sundry merchandise by manufacturer, wholesaler and retailer is a deliberately planned and conducted business. Considerable research into public requirements has resulted in rationalized ranges of prepacked and priced products. Furthermore, package design and presentation has given many articles a new appeal to the potential buyer. The contents of packets, boxes, etc., are carefully decided to give not only value for a specific price, but to make the operation of buying and selling economic for both distributor and retailer.

While some articles are bought out of necessity, many more are sold by display and impulse buying. The importance of good display cannot be over emphasized, especially where self service, or self selection, is employed. For this reason, trading manufacturers and distributors supply display units and sales aids for their products, with initial stock orders or as part of a "package deal." Detailed motivational research has also been made to find out what makes people buy on impulse and this has been linked with modern graphic techniques, so that the use and value of each article is instantly recognized and accepted by the potential purchaser.

In order that planned design and marketing may fulfill its purpose, it is essential that display and selling units are used to full advantage to produce maximum sales. Correct siting of a unit is obviously a major factor since the products will only sell in direct relation to the number of people passing it. It follows, therefore, that the unit should be placed in a well lit and well frequented part of the shop. Such units are usually designed to take up floor, wall, or counter space, not otherwise being used. Intelligent purchasing from the ranges of packaged sundries available, together with similar use of display units, can turn what has been an untidy and uneconomic department into an attractive and profitable one. As with other sections of the shop, it is obvious that such stock must be kept in sufficient quantity and clean. A good stock control system will meet this need. Some suppliers are able to offer a system for their own products.

Part II

The subjects in this part of the book cover the requirements of the commercial, industrial and educational sections of the community. Without doubt, a substantial portion of the commercial stationer's business is in respect of these commodities and therefore a complete understanding of the subjects is essential. On these subjects is based the Intermediate Part I Grade of the Association's examinations.

Chapter 6. Paper and Board
,, 7. Envelopes and Bags
,, 8. Account, Commercial and Educational Books.
,, 9. Loose Leaf Books and Systems
,, 10. Filing, Card-Index and Visible Record Systems
,, 11. Printing Processes
,, 12. Artists' Materials
,, 13. Drawing Materials

CHAPTER 6

Paper and Board

Paper and board form, without doubt, the largest section of raw materials used in the stationery and office equipment industry; either may be used as a product in itself or converted into a wide variety of merchandise. In addition, large quantities are used for the packaging and wrapping of goods. It must also be remembered that their use is not confined purely to the stationery and office equipment industry.

The technology, manufacture and classification of paper is complex enough to be dealt with in a separate volume, and there are several books available for those who require to study the subject in detail. The aim of this chapter is to present the subject in a simple and concise manner and to give an overall survey that will be of interest and value to the stationer.

1. Historical Survey

Origin of Paper-making

At a very early age man commenced to communicate his ideas on some more or less durable surface by means of signs intelligible to the eye. This is so long ago that its beginnings are lost in antiquity, yet tangible evidence still remains of the first efforts at writing by prehistoric man.

The two main stages in the development of writing were ideography, the representation of objects or ideas by means of pictures, and phonography, the representation of sounds by written symbols.

The early Egyptians carved their hieroglyphics upon stone and the Chaldeans impressed their cuneiform characters on cylinders of clay. Probably the most famous of these early stone-writings is the Rosetta Stone, which is now in the British Museum. It is a black basalt slab bearing an inscription in three versions, hieroglyphic, demotic and Greek, and it supplied Champollion with the key for the decipherment of the ancient monuments of Egypt.

A further development came in early Biblical times, when thin slices of wood were used as a writing material, superseded later by the leaves of palm, olive and poplar trees, and later still by the skins of animals and by papyrus, which was first used at approximately 2000 B.C.

Papyrus, the immediate predecessor of paper, and from which the word "paper" is derived, was rendered into a writing material from a plant growing freely in the marshlands of lower Egypt, by slicing the inner pith and hammering it into thin strips. These strips were placed side by side, first a layer all in one direction, and then a layer athwart the first, the whole being gently hammered to form a sheet, the sugary matter in the plant producing sufficient glutinous matter to make adherence easy.

The surface was smoothed for writing by rubbing with a piece of polished ivory. The average size papyri was about 18 in. by 6 in.

The invention of paper from vegetable cellulose is attributed to the Chinese about A.D. 100, and it is alleged that in a battle near Samarkand in the year A.D. 704 between the Arabs and the Chinese, in which the former were victorious, the secret of paper-making was learned from some of the Chinese prisoners.

But centuries were to pass before this knowledge gradually permeated Europe, and the eleventh century had arrived before there were records of paper-making in Moorish Spain.

In the early fourteenth century, Italy was the chief paper-making country, and merchants from Lombardy attended all the principal fairs of Europe to sell the products of her mills.

Holding practically a monopoly, they took advantage of their position to raise their prices so excessively that in 1354 the King of France granted letters patent to the University of Paris to select four sworn papermakers at Troyes and Essonne, who should make fine paper for the use of the University and be exempt from any kind of taxation.

By the seventeenth century, France, largely influenced by the methods of the Italian workmen whom Colbert had enticed to come to France, had taken the lead in paper-making, exporting to all European countries.

This pre-eminence she held until the revocation of the Edict of Nantes (1685), when non-Catholics were persecuted and expelled from France. Many of the master papermakers were Protestants or Huguenots and withdrew to Holland and England, both of which countries benefited by their knowledge and skill.

Up to this time the Dutch had been mainly paper merchants, but they now blossomed forth as manufacturers, selling their products to the countries which previously supplied them.

Paper-making in England

The first knowledge of paper-making in England is that of a short-lived mill at Stevenage operated from 1490 to 1498 by John Tate, specimens of whose paper are still to be found in certain old books, and it was almost half a century later before the mill of John Spielman (1548-1605) was erected at Dartford, Kent.

In this mill about 600 people were employed; its owner was knighted by Queen Elizabeth, who also granted him a licence "for the sole gathering for 10 years of all rags etc., necessary for the making of such paper."

Up to the beginning of the eighteenth century several attempts were made to manufacture paper in this country, but the efforts were of short duration and unable to supply the national demand.

In 1690, Grosvenor, Chater & Co. erected the Abbey Mills at Holywell in North Wales, a mill still in existence, as is also the Laverstoke Mill founded in 1718 by Henry de Portal, a Huguenot refugee from France. In 1725 he was granted a monopoly of making paper for Bank of England notes, and bank-note paper has been made at Laverstoke Mill ever since.

In 1739 James Whatman established his mill at Maidstone, a mill still famous as the maker of the highest-class drawing paper in the world. For a considerable time his paper was manufactured at two mills, the English product being watermarked "J. Whatman—Turkey Mill," and the Dutch product watermarked "J. Whatman—L. V. G.," the initials of the Dutch papermaker, L. V. Gerrevink.

The preparation of the raw materials for paper-making was a slow and laborious undertaking. The rags, after being moistened, were stacked in heaps until partial fermentation rendered the gummy and resinous matters soluble in water; they were then pounded in wooden mortars and beaten for at least 24 hours by heavy stampers driven by such power as could be obtained from a water-wheel.

Towards the end of the seventeenth century a Dutch invention consisting of a cylinder fitted with knives revolving in a cast iron trough displaced entirely the slow and laborious method of disintegrating the fibres by stamping. This machine acquired the name of "The Hollander," and its principles are still retained in the present-day beating engines; it was in use in England by about 1770.

Up to 1750 all paper had been made on "laid" moulds, but in that year "wove" moulds were first used by John Baskerville, the famous printer of Birmingham, for the paper on which his *Virgil* was printed.

Till then the manufacturing skill of Great Britain had made little advance upon ancient practice, yarn was still spun into cloth by means of the spindle and the distaff, paper was still made laboriously sheet by sheet, sea transit was by sail, and road transit by coach and wagon, but an era of invention was setting in which paved the way to the Industrial Revolution.

Arkwright's spinning frame, Crompton's spinning mule, Cartwright's power loom and Whitney's cotton gin brought into play new powers which were to revolutionize the linen and woollen trades. James Watt's steam engine, perfected in 1775, introduced a source of mechanical energy which quickly changed the face of the world. On a visit to Paris at the instance of the French Government in 1786, James Watt became acquainted with Berthollet, whose method of bleaching with chlorine he introduced to this country with certain improvements of his own, and later Tennant's invention of bleaching powder and Leblanc's manufacture of soda enabled other vegetable fibres than rags to be used in paper-making.

In 1798 Louis Robert was mill manager of a paper-mill in Essonne, a town previously mentioned, in which some of the sworn paper-makers to the University of Paris worked in 1354, and there he made his first attempt to manufacture paper in a continuous web.

His employer, M. Didot, brought over to London in 1800 a small model of the machine with a view to raising capital; he sold the patent rights to his brother-in-law, Gamble, who interested the Messrs. Fourdrinier, at that time the principal stationers and paper manufacturers in Great Britain, in the practicability of the invention. The Messrs. Fourdrinier enlisted the services of Mr. Bryan Donkin, a capable and ingenious engineer, who added improvements, and in 1804 the first Fourdrinier machine was patented and erected at Two Waters Mill, Hertfordshire.

Their enterprise, although of such material advantage to the industrial world, was but ill-rewarded, and although the Fourdrinier machine became a commercial success the pioneers reaped no benefit.

Round about this time another pioneer in the history of paper-making, John Dickinson, the founder of the firm which bears his name, also invented a machine for the manufacture of paper in a continuous web. This was known as the cylinder machine, and his first machine was established at Boxmoor, Hertfordshire, in 1809. While the Fourdrinier machine has become the standard machine for paper manufacture, the cylinder machine has become standard for the making of boards.

Investigation and research went hand in hand, and new materials for paper-making were constantly being sought.

Resin size, introduced by Illig in 1807, enabled the pulp to be sized in the beater; steam drying cylinders; the invention of the dandy roll; the use of vacuum boxes; circular knives for slitting; and a never-ending stream of improvements, continually increased the efficiency of the machine.

The discovery of the uses of mechanical wood-pulp. followed later by soda wood-pulp, gave a fillip to paper-making, but the greatest impetus of all came in the year 1860, when the crippling duty on paper was totally abolished, and the same year brought the introduction of esparto grass as a new fibre in the paper-making world. Another important milestone is the year 1872, since it was then that C. D. Ekman first produced wood-pulp by an acid process on the large scale. This type of pulp (sulphite pulp) is now used widely for writings and printings.

It has been confirmed that paper was for centuries made by hand and that the first machine for making paper was built in 1800. Since then there have been many improvements and there are now tissue machines turning out paper at over 3,000 ft. per minute.

The original process of making paper by hand is still used to only a limited extent in a few places, largely for a speciality market.

At one time the hand-making process was associated with the idea of great durability; however, it is now realized that durability is largely a question of the quality of the fibres used and the control over the making process. Consequently the most durable papers, as well as the least durable, can be made on paper machines.

Obviously this is not the place for a detailed account of paper manufacture, but the ensuing sections will give a useful outline of the process.

Watermarks

This survey would not be complete without some reference to watermarks. Their history is worthy of special study, for in themselves they provide a vast amount of information about the development of paper-making. Several, in their inception, possessed a religious significance, but later they became associated with particular sizes, and it is popularly believed that many of the present-day size names trace back to these early watermarks.

The original idea behind the use of the watermark, which seems to date from the fourteenth century, was apparently the desire for a characteristic mark for distinguishing purposes, and, as each papermaker had moulds of a particular size, the watermark eventually became associated with that size.

Even in those early days unscrupulous imitators copied the designs of any maker who had gained a reputation for quality, and the same designs, or colourable imitations of them, became common throughout Europe. In many cases, although the design had fallen into disuse, its name remained as a size.

The size now known as foolscap derived its name from a watermark, largely used on the Continent of Europe, of a jester with cap and bells, and was employed in England by John Spielman on the papers manufactured in his mill at Dartford, Kent, in 1588. On the Continent, however, the design did not indicate the size, as it was applied to various sizes of paper. On foolscap papers generally this watermark has now given place to the Dutch lion or Britannia design.

Some British paper sizes derived from watermarks are:

		in.
Grand Eagle	Eagle design	42 × 28
Atlas	The word "Atlas" and papermaker's initials	34 × 26
Imperial	Unknown	30 × 22
Elephant	Elephant design	28 × 23
Royal	Royal hand design	24 × 19
Post	Post horn design	19 × 15

Foolscap	Cap and bells design	16½ × 13¼
Crown	Crown design	20 × 15
Pot	Tankard design	15 × 12½

The following French and Belgian sizes are derived from watermarks, and the fairly close relationship in size between these and British papers of similar names should be noted.

		in.
Grand Aigle	Eagle design	41 × 27⅝
Colombier	Dovecot design	33½ × 24½
Elephant	Elephant design	30⅜ × 24½
Royal	Royal hand	24⅞ × 19
Ecu (our demy)	Shield design	20½ × 15¾
Couronne	Crown design	18⅛ × 14¼
Ruche	Beehive design	18¼ × 14¼
Propatria	Maid of Holland design (prototype of our Britannia)	17 × 13⅝
Pot	Tankard design	15¾ × 12½
Cloche	Bell design	15¾ × 11⅞
Lys	Lily design	15⅝ × 12½

This deals only briefly with the subject, but it is hoped that it will be of some interest and will indicate in some measure the important influence which watermarks have, in times past, exercised on paper-making.

2. Raw Materials and Stages of Manufacture

Cellulose Fibres

Paper can be defined as a web having a very small thickness in relation to its area, and made up of separate fibrous elements. It therefore has a discontinuous structure, and usually contains air spaces in between the fibrous elements.

Traditionally, paper has been made from fibres having their origin in the tissue of plants, in which they perform a function of reinforcement. The fibres are very small and of length much greater than the width, so that a typical fibre dimension would be 1–2 mm. long × 0·02–0·03 mm. wide. These natural fibres are made of a substance called cellulose, which has certain affinities in its chemical nature with starch and sugars.

A sheet of paper, then, can be regarded as an interlaced network of small fibres which are bonded together in some way so that the whole sheet has a certain degree of strength. That this is so can easily be demonstrated by tearing any piece of normal writing paper; it will be found that a certain amount of force is required, and the torn edge of the paper can be seen by the naked eye to have a fibrous nature.

The reason why paper has been traditionally made of these cellulose fibres is twofold.

1. They were readily available in sufficiently large quantities, with a relatively simple technology.
2. The peculiar nature of cellulose fibres is such that, in the presence of water and with the aid of a certain amount of mechanical treatment, the cellulose fibres will stick to each other when the paper is dried. Among the materials available to industry this is an unusual property, and without it the paper industry could scarcely have been created.

It should be remembered, however, that in the present day with increasing technology other materials are becoming available which can be used to stick cellulose fibres together, and currently this can be done with various types of synthetic resin, synthetic rubber latex and, of course, starch.

The cellulose content of the fibre varies from plant to plant, and this factor, together with availability and cost and type of paper to be made, has to be considered carefully by the papermaker.

The most suitable sources are:—

(1) Wood-pulp derived from trees.
    (This is far and away the largest available source).
(2) Esparto grass
(3) Straw
(4) Bagasse (from the sugar-cane industry)
(5) Rags (including cotton linters)
(6) Bamboo, sisal and other fibres.

Stages of Manufacture

With each of these raw materials there are several successive stages in manufacture.

(1) *Boiling and preparatory processes.*

Separation of the fibre from the original raw material may be merely a mechanical operation, but more usually it consists of a chemical cooking process designed to remove some, if not all, of the non-fibrous material which binds the fibres together.

(2) *Beating and other operations.*

Having prepared the fibres or received them from another source, the papermaker has several operations to carry out.

The mechanical treatment, often known as beating is designed to bring the fibres into a condition in which they will bond together. At the same time, the average length of the fibres may be reduced to a suitable figure for the type of paper to be made.

Various cleaning operations are carried out to remove dirt and unwanted material.

Additions are made to the fibrous stock in order to modify the properties of the paper to be made. The most important are loadings or fillers, sizing substances and colouring matters.

(3) *Making on the machine.*

The actual making of the fibre web on the wet end of a paper machine.

The drying of the web on the dry end of the paper machine.

(4) *Surface treatment.*

This may be given to the paper in the form of tub size or size press baths containing various substances.

(5) *Calendering and finishing operations.*

Additional finishes may be given to fine paper and the final cutting, packing and dispatching operations are carried out.

3. Boiling and Preparatory Processes

Wood-pulp

Wood-pulp forms the largest class of papermaking materials and today is used as the basis for an immense variety of qualities of paper. There are two broad classes of wood-pulp, each prepared in different ways.

(1) In one the logs are subjected to *mechanical grinding* action to separate the fibres as far as possible.

(2) The other process involves some kind of *chemical digestion* to remove the non-fibrous material such as lignin, and leaves a chemically purer fibre for the papermaker.

Clearly the mechanical process will result in a cheaper wood-pulp because only a small amount of water-soluble material is lost and the yield of saleable papermaking material per ton of wood is obviously higher.

When chemical action is resorted to, so that non-fibrous substances may be removed, then the resulting material must bear a higher cost, due not only to the chemical processes themselves but also to the lower yield per ton of tree wood. This lower yield, therefore, can be tolerated only where the properties of the wood-pulp justify the higher cost.

The chief disadvantage of the mechanical type of wood-pulp is that the non-cellulosic material present, such as lignin, interferes with the keeping qualities of the paper and it consequently yellows rather rapidly with time. On the other hand, this type of pulp confers advantages in the shape of more uniform appearance and formation and greater opacity and, in some cases, better printing qualities. It is eminently suited, therefore, to certain types of printing usage where the material is thrown away after only a relatively short time. Chief of these, of course, are newsprint and other printing papers.

The trees used for production of wood-pulp embrace a large number of species falling into two broad classifications.

(1) The long-fibred woods such as pine and spruce

(2) The shorter-fibred woods such as beech, aspen, poplar, oak, etc.

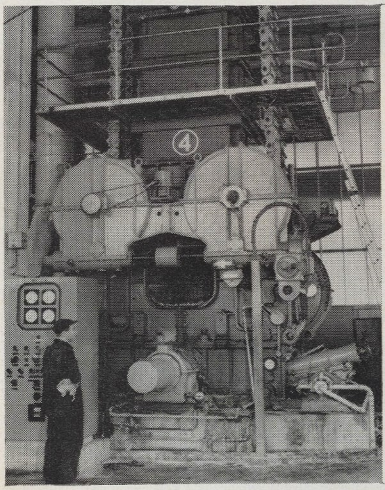
These trees are found in many parts of the world, the chief suppliers to Great Britain being Scandinavia and North America. Many of the forests are in northerly countries, but, where trees are being deliberately planted as a crop with the intention of felling them for wood-pulp as soon as they reach a suitable size, then there is an advantage in planting them in warmer latitudes where they will grow more quickly. Examples of this type of plantation are in Florida, Portugal, Brazil and Swaziland.

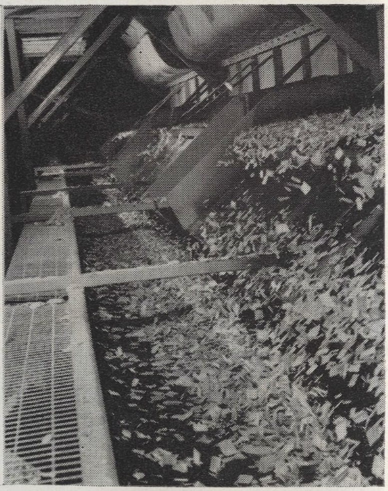
Unloading Logs at a Paper Mill.

The trees are felled in a given area and transported to a pulp mill. In earlier days this transportation was usually by river, but nowadays all new forestry operations tend to be carried out with the aid of logging roads and very heavy lorries or lorry trains. In either case a pulp mill has to be backed by a considerable hinterland of forest which can be economically cut over. The basic cost of wood into the pulp mill is an extremely important economic factor which may make or break the pulp mill.

However they are transported, the logs arrive at the pulp mill with the bark on and the first operation is to remove the bark. This is done either by tumbling the logs in large drums, whereby the bark is rubbed off, or by more sophisticated mechanical means of rubbing off the bark. On the west coast of the U.S.A. large logs may be de-barked by high pressure water jets. Since the logs are not perfectly smooth cylinders it is clear that none of these methods of removing the bark will be perfect, and occasional particles of bark get through and have to be removed at a later stage. After inspection the logs pass on to the next stage in the process, any logs which fail in selection being returned for another pass through the de-barking operation.

In the case of *mechanical* pulp the de-barked logs now pass to a large grinding wheel against which they are held in the presence of water so that the logs are slowly broken down into more or less fibrous particles. The temperature of the water and the rate at which the operation is carried out play a part in the quality of the


Chain Grinder for Producing Mechanical Pulp.


Chips of wood tumbling from the screen which has removed unwanted sawdust.

product, so that the slower the logs are put through, the higher the cost in terms of power per ton, and the better the quality of the ground-wood produced. Clearly it is not possible to defibre the piece of wood completely by mechanical means in this way, so that at best ground-wood is only a compromise.

Where a *chemical* pulp is to be produced the de-barked logs proceed to an apparatus called a chipper, which consists of a heavy flywheel bearing knives against which the log is run at an angle. The resulting chips are about $\frac{1}{4}$ in. thick and vary in area from about $\frac{1}{2}$ in. × $\frac{1}{2}$ in. to about 1 in. × 1 in. The thickness is the important measure, and this is carefully controlled because it determines subsequently the rate of penetration of the chemicals.

The chips are then conveyed by belt conveyor to a storage area, and, in modern mills, a large part of the storage capacity of the plant is in the form of the chip storage piles.

Next the chips are conveyed to the digester house, where they are fed mechanically into the digesters. In the older mills these digesters are huge cylindrical vessels of up to 300 cu. meters capacity, and the height of a multi-storey building. The chips are cooked for a definite length of time with chemicals in these digesters, and then discharged. In some of the latest pulp mills the chips are digested continuously in a tall cylindrical digester through which the chips move steadily. In this way a much larger output can be achieved from a smaller area of plant. However, the control required is, of course, more complex in order to achieve the desired result.

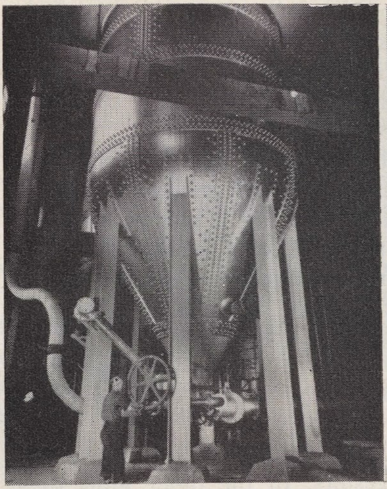
There are *two* main types of chemically prepared pulp.

(1) In one the chips are cooked with an acid liquor consisting of calcium bisulphite with extra sulphur dioxide in solution. Using the same basic process it is possible to use sodium, magnesium or ammonium as the base in place of calcium where this is economically convenient. This type of cooking, being acid, requires acid-resisting linings to the digesters. It is traditionally known as the *sulphite process.*

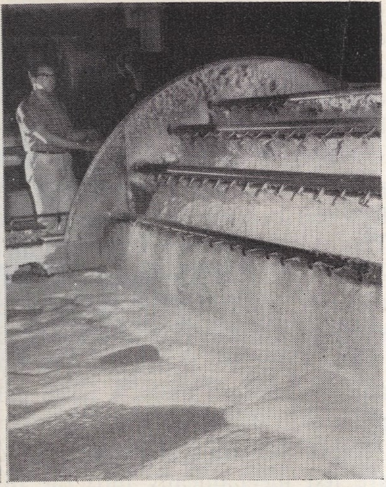
(2) The other type of cook is the alkaline or kraft cook. The reactive chemical here is sodium sulphide, but the strength of the reagents during the process is made up by additions of sodium sulphate which become reduced to sodium sulphide, and so traditionally this process has come to be known as the *sulphate process.*

In both processes the cooking proceeds for a definite time at a definite temperature or range of temperatures, and variation upon these causes a change in the quality of the pulp produced.

The essential action that is going on is the penetration of the chip by the chemicals, followed by the conversion of the lignin into a form in which it is soluble and can be removed. Since it is necessary



The Bottom of a Chemical Digester. Wood chips are cooked in chemicals until the natural binding substances in the wood are dissolved, leaving a fibrous pulp. A digester may be 40 ft. high and its steel shell may weigh 40 tons.



A Rotary Pulp Washer, used to remove the soluble lignin or black liquor.

in removing the lignin not to damage the cellulose any more than can be helped, the result is that there are very few chemical processes which are practicable for this purpose.

However, in removing the lignin, the reactive chemicals also have an effect upon part of the cellulose and in particular on that part generally known as hemicellulose. A drastic sulphite cook, for instance, will remove so much of the hemicellulose that the resultant material is relatively pure cellulose, but the yield is correspondingly reduced.

Generally speaking, the sulphite process is more amenable to variations in the cooking procedure, and consequently can be made to yield a greater variety of pulps with different characteristics than can the sulphate process.

The sulphate process can be made to yield a strong pulp with a relatively low digestion time; consequently such pulps are used in making strong cheap papers such as bag papers.

After the cooking process there follows an important washing operation, during which the solubilized lignin is removed and, by means of various types of screens, any undigested particles or knots or contraries are also removed. This screening operation is a very important one for the production of a good quality pulp.

The removal of lignin does not, however, produce a high white colour and where this is required there must follow a bleaching operation. This is normally carried out in modern pulp mills by means of a complex multi-stage continuous system, in which the pulp is passed through a series of towers at various concentrations. In essence the system consists of, first, a treatment with chlorine gas, which solubilizes the remaining lignin and reacts with coloured products present, followed by an alkaline stage where the reaction products of the chlorine treatment are removed; this is followed by a treatment with hypochlorite. This three-stage system is extended in various ways by extra washing, and nowadays many mills also bleach with chlorine dioxide, perhaps the most effective bleaching agent known. It is the use of chlorine dioxide that has allowed the production of high white sulphate pulps, as previously the three-stage bleaching process had not been able completely to bleach sulphate pulps.

Since it is possible to remove lignin in a multi-stage bleaching system, it is obviously possible to change the balance of the removal of lignin as between cooking and bleaching, the criteria being the ultimate properties of the pulp required in relation to the economic costs of the various processes.

It must be remembered that the more complex processes not only add to the cost in themselves but, by reducing the yield on the original timber, add to the cost on that score.

A great deal of work has been done in recent years towards the production of high-yield pulps. These are pulps where as much hemicellulose as possible is left and no more lignin is removed than is strictly necessary. In this way it is possible to produce a pulp which is effective for a specific purpose at the lowest price.

The final stage, so far as the pulp mill is concerned, is to run the finished pulp stock over a sheet-forming machine which is somewhat like a paper machine. The resulting web may be pressed as much as possible to remove water and finally baled as wet pulp with approximately 50 per cent. dry solids, or the web after pressing may be passed into a hot-air dryer or over steam-heated drying cylinders to produce a dry sheet which is subsequently press-baled for transport. Where the paper mill is adjacent to the pulp mill, the finished pulp stock may be pumped through a pipeline and used directly, thus effecting some real savings.

The selection of a wood-pulp for a specific purpose calls for a consideration of the following points:—

(1) Choice of tree species, principally the difference between short-fibred hardwood and long-fibred softwood.

(2) Selection of the cooking process such as sulphite, sulphate, or one of the newer processes such as neutral sulphate or combined acid/alkali processes.

(3) Within the confines of the process chosen, selection of the particular type of cook—*e.g.*, whether the pulp should be a high-alpha pulp or whether it should be a pulp containing a lot of hemicellulose.

(4) Determination of what level of bleaching, if any, the pulp should have.

In practice these matters are dealt with by selecting a particular brand of pulp by a particular manufacturer. The level of control exercised by the pulp manufacturer nowadays is of a high order, so that variations of a particular pulp brand from consignment to consignment are not large.

Esparto Grass

This is a stiff grass which grows wild in North Africa and Spain and is collected and baled for transport. At one time all the esparto used in this country was brought here as grass and cooked in this country. However, in recent years an increasing quantity of esparto has been cooked and bleached in pulp mills in France and North Africa and supplied in a manner similar to that for wood-pulp.

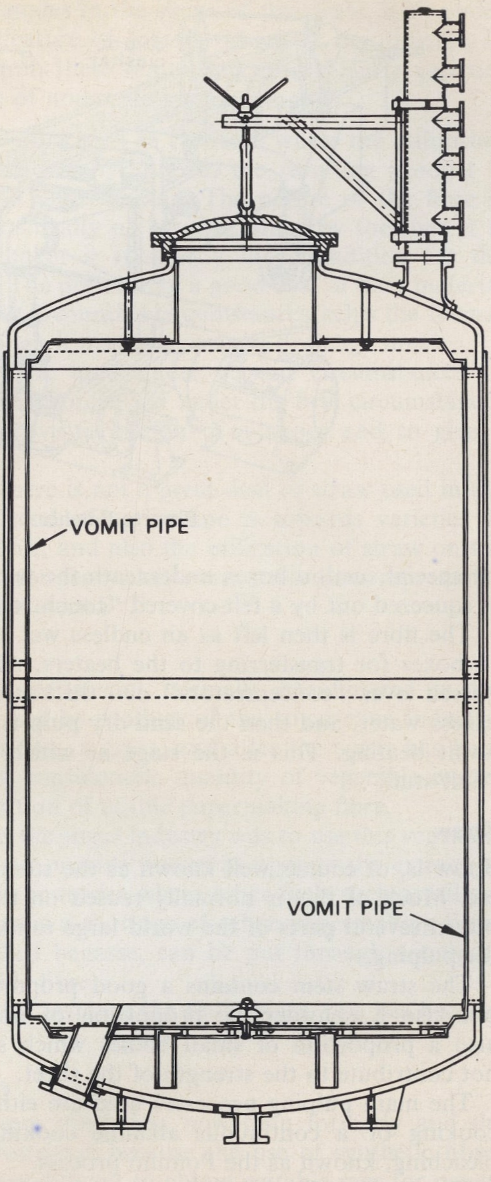
The procedure for cooking in this country is as follows:-

On arrival at the mill the first process is to "dust" the grass. The bales are opened and the contents fed into the "duster," which is a conical-shaped machine containing an arrangement of arms, rotating at high speed. The grass is flung around and the heavy sand, stones, etc. contained in it pass through screens at the bottom, while the lighter dust is sucked out by means of a fan. This light dust is a valuable by-product and is sold to firms who extract the wax from it. After dusting, the grass is taken to the boilers, usually by a conveyor.

The grass boilers are upright cylinders, and are generally of what is known as the "vomiting" class, which means that the liquor is circulated through the grass by means of steam pressure. These boilers vary in size, but hold on the average about 5 tons of grass, which is boiled with caustic soda under a steam pressure of about 50–60 lb. per sq. in. This process takes between four and five hours, after which the black liquor is drained away to the soda recovery department and the pulp is washed.

The boiled esparto grass is next removed by a high-pressure water jet and is pumped to the esparto potchers, where the washing is continued by means of large-sized drum washers, until all the black liquor has been removed. Bleach is then added in sufficient quantities to produce a fine white colour.

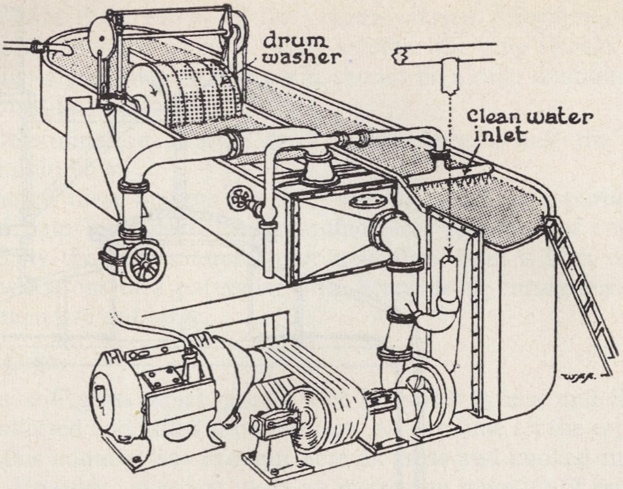
At this stage the bleached esparto grass runs over long troughs fitted with corrugated bottoms known as sand tables, where heavy particles settle out, then through strainers to remove any large unpulped stalks or stones, etc. As in this state it is too dilute for



Vomiting Class Boiler.

use, the fibre is usually passed over a "press pâte" to concentrate it.

The press pâte is a continually moving, endless web of wire gauze on to which a dilute suspension of fibres in water can flow. It is fitted with "deckle straps" on each side to prevent the fibre suspension overflowing. The water drains through the wire, more is removed



Esparto Potcher.

by special suction boxes underneath the wire, and finally still more is squeezed out by a felt-covered "couch roll."

The fibre is then left as an endless wet sheet, which is collected in boxes for transferring to the beaters. Alternatively, the pulp is passed over "concentrators" or "thickeners", which remove the excess water, and then the semi-dry pulp is dropped into chests to await beating. This is the stage at which esparto grass is called "half-stuff".

Straw

Straw is, of course, well known as the stems of wheat, barley, oats, etc. Much of this is normally reused on the farm, or even burnt, but in several parts of the world large tonnages are made available for pulping.

The straw stem contains a good proportion of cellulose fibres, but also a considerable proportion of non-fibrous material and also a proportion of small bodies which survive pulping and do not contribute to the strength of the sheet.

The main pulping processes used are either a batchwise alkaline cooking or a continuous alkaline cooking process followed by bleaching, known as the Pomilio process.

The main difficulties encountered with using straw as a raw material are:—

(1) Organization of the collection of straw on an economical basis from the farms, and maintenance of it in a clean condition until it reaches the pulp mill.

(2) The presence of nodes in the stems of the straw, such nodes being a normal feature of grasses. Much of the difficulty in pulping arises from these nodes and consequently varieties with a minimum of nodes are an advantage.

In those parts of the world such as Holland, where the utilization of straw has been systematically studied, the resulting product is a very useful adjunct to papermaking. The nature of the fibre is such that it requires practically no beating, since by the time it is received by the papermaker it is already in a condition for the fibres to bond together. The presence of a good deal of finer material as well as longer fibres in favourable circumstances helps the formation of the paper, although it may increase the drainage time.

Straw may therefore be used under certain circumstances to cheapen a furnish, or when processed under the best circumstances it may be used to improve formation of a paper and to give a crisper rattle.

At the present time, there is not a great deal of straw used in the British Isles, and the trend of agriculture is towards varieties of cereal with shorter stubble, and also the utilization of straw on the farm. During times of emergency, however, straw does represent a valuable reserve fibrous material.

Bagasse

Bagasse is a fibrous material not normally encountered in the United Kingdom as it is a by-product of the sugar-cane industry. The sugar-cane is, of course, a grass, and after the sugar has been extracted there is left a considerable quantity of vegetable matter which contains a proportion of usable papermaking fibre.

The earlier practice in the sugar industry was to use this vegetable matter as fuel in order to provide power to operate the extraction plants. In sugar-growing countries where other fuels such as oil are available or where there is a shortage of other papermaking fibre, this waste material, called bagasse, can be put through a pulping process to produce usable fibre.

In certain countries, for instance the Philippines, this has become an important industry.

Rags and Cotton Linters

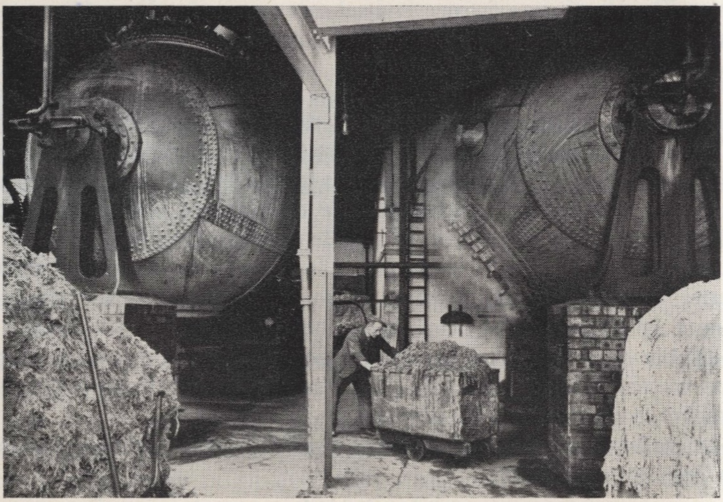
Rags: Rags are used very much less now than formerly and the supply is much more restricted because the use of synthetic fibres in garments makes it very difficult to obtain suitable rags for papermaking which are free from plastic contraries. Where new cuttings and clippings from the manufacture of garments are obtainable it is possible to know accurately what is the content of usable fibre.

At the mill the material is first sorted to remove contraries, and after this the rags are passed through a duster. This consists of a long revolving cylinder covered with wire mesh. After this they pass to a cutter which reduces them in size to the dimensions required for cooking. Sometimes powerful electro-magnets are placed under the conveyors to extract particles of iron which would otherwise contaminate the paper.

The next process is to subject the rags to boiling for the purpose of:—

(1) loosening any dirt and stiffening;
(2) saponifying grease and oil so that it may be washed away;
(3) beginning the decomposition of colouring matters.

The rags are usually boiled with caustic soda in revolving cylindrical or spherical boilers under a steam pressure of 25–45 lb. per sq. in. The time of boiling varies according to the class of rags: the dirtiest and greasiest require up to 12 hours, while new cuttings only need about 4 hours. At the end of the boil the used caustic liquid is drained away and the rags are tipped out for the next stage in the process of their conversion into paper.



Spherical Rag Boilers.

The rags are then taken to the rag "potchers" for washing and bleaching. The "potcher" consists of a trough with a partition down the centre called the mid-feather around which the rags circulate. On one side is a revolving roll, fitted with bronze bars, which works against a stationary bed-plate with similar bars, made of steel. This mechanism is the basis of the breaking and beating process. The rags pass between the revolving roll and the bed-plate, where the fibres are pulled apart without actually being cut. In effect, the breakers are undoing the work of the weavers.

The potcher is also fitted with a "drum washer," consisting of an extracting cylinder covered with a wire screen. Clean water is run in before the roll, and the dirty water eventually passes through the screen of the drum, which is fine enough to prevent the escape of the fibres. Thus, by continually adding fresh water, a washing action takes place, which, together with the breaking action of the roll, soon reduces the boiled rags to a clean and disintegrated pulp.

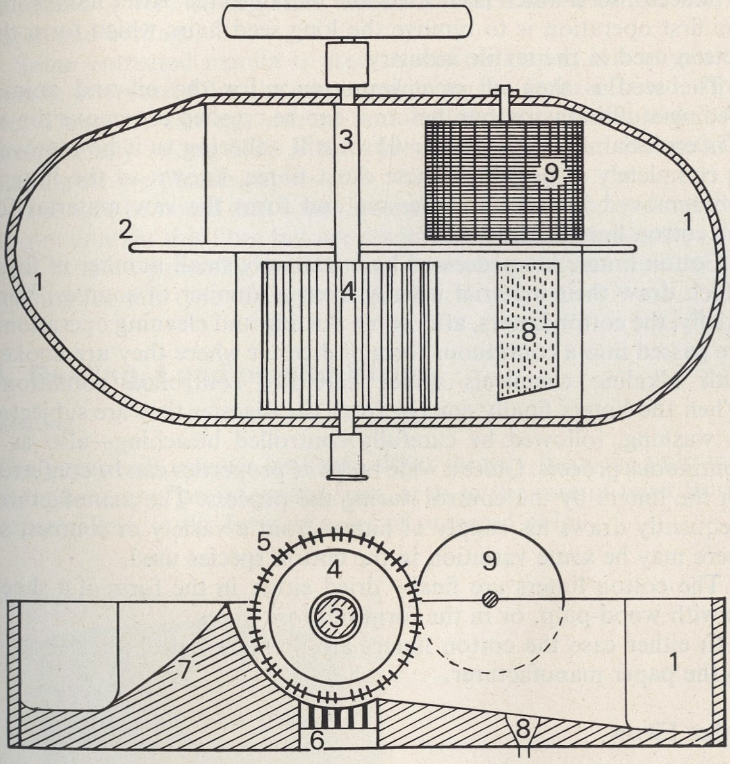


Diagram of a Rag Breaker-Potcher in Elevation and Plan.

1. Semi circular ends.
2. The mid-feather.
3. Shaft.
4. Bar roll.
5. Bronze bars.
6. Steel bars of the bed-plate.
7. Backfall.
8. Dirt trap.
9. Drum washer.

When all the dirt and greasy water have been washed out of the rags, bleach solution is added and the circulation of the fibres is continued until they reach the white colour required for high-grade papers. This bleaching finishes the decomposition of the colour. The contents of the potcher are then let down into a big draining tank, called a "steep", which has porous tiles in the bottom to allow the water to drain away. After about 24 hours the pulp becomes fairly dry and can be dug out into boxes to be taken to the beaters.

Cotton Linters: These have become very widely used in recent years, owing to the difficulty of obtaining supplies of good quality rags.

The cotton plant, which is a member of the mallow family, produces a seed which is encased in a ball of fibres. After harvesting, the first operation is to remove the long seed hairs which form the cotton used in the textile industry.

The seed is then of great importance for the oil and animal feeding-stuff industry, but, before it can be crushed to remove the oil it is essential that the shorter fibres still adhering to it be removed as completely as possible. These short fibres, known as the linters, are removed by special processes and form the raw material for the cotton linters industry.

Cotton linters are processed by a relatively small number of firms which draw their material usually from a number of sources. Very briefly, the cotton linters, after some dusting and cleaning operations, are passed into a continuous form of digester where they are cooked with alkaline chemicals under carefully controlled conditions. When the linters finally emerge from the digester they are subjected to washing, followed by carefully controlled bleaching—also as a continuous process. Quite a wide range of properties can be conferred on the linters by the control during the process. The manufacturer frequently draws his supply of linters from a variety of sources, so there may be some variation in the cotton species used.

The cotton linters are finally dried either in the form of a sheet, as with wood-pulp, or in the form of loose fibres.

In either case the cotton linters are pressure-baled for transport to the paper manufacturer.

Other Fibres

Bamboo: This is widely available in the tropics but it is mainly in India and Pakistan that it has been used as a paper-making fibre. It grows very rapidly and in many areas is the only available cellulosic material.

When pulped by the soda process or the sulphate process it yields a useful fibre with, however, a considerable proportion of small fibres and cells. It is thus not dissimilar to straw and suffers from the same disadvantage that the nodes present a considerable difficulty in pulping. Usually the nodes are subject to mechanical treatment before the digestion starts.

As with straw, bamboo is best used in a mixture with longer wood fibres and many satisfactory papers are produced in this way.

Jute: This plant grows in Asia, particularly in Pakistan, and the fibres are well known in the form of hessian baggings, sackings, etc.

Waste jute cuttings etc. may be given an alkaline boil with milk of lime to produce a pulp which can be used in the manufacture of packaging papers.

Manila: This is a plant of the plantain type indigenous to the Philippine Islands, but now found in other tropical lands. From it is produced a very strong fibre which is well known for its use in ropes and cordage.

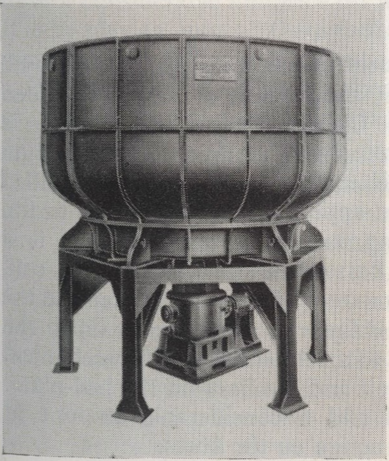
Some untreated manila is used in making paper, but in general manila is received by the papermaker in the form of used ropes etc. These are cut up, dusted and boiled with caustic soda. An exceptionally strong fibre is thus produced which can be used for making strong pliable papers.

It should be noted that some brown papers described as "manila" do not contain this fibre but are made wholly from wood-pulp. The term is now generally used to indicate characteristic colour, the spelling for this type of paper is manilla.

4. Beating, Loading and Sizing

Beating

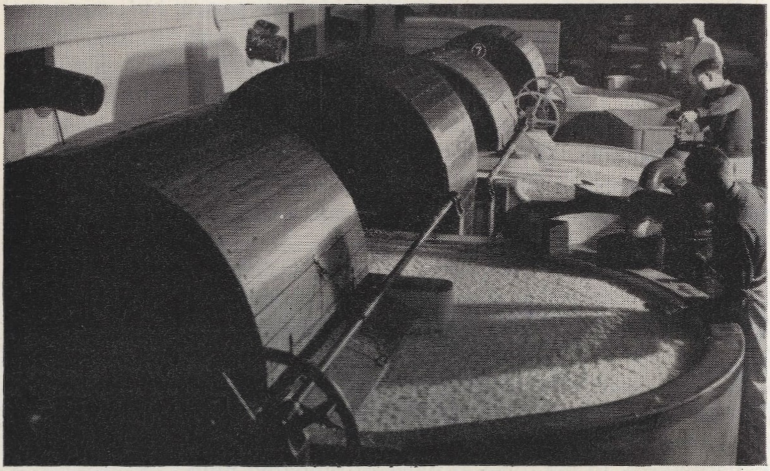
The paper-mill receives its fibres either directly from the pulp mill, as in the case of an integrated unit, or as in the case of most British papermakers, in the form of bales of prepared pulp.



One Design of Pulper known as the Hydropulper.

The first action is to get the fibres dispersed in water, if they are not already so dispersed. In most modern mills a special piece of equipment called the "slusher" or "pulper", is used for this. There are numerous designs, but essentially they consist of a large tub, perhaps as much as 20 ft. in diameter, containing some form of powerful and high-speed agitator. When the fibres have been wetted and completely dispersed, they are then pumped to the beating equipment.

In essence, beating consists of carrying out a mechanical grinding action on the fibre in the presence of water.



Beaters. The Hollander beater is similar in general design to the breaker-washer, but has no drum washer, and the bars are differently spaced.

The traditional piece of equipment in which this has been carried out is called the Hollander beater, and consists of a trough divided by a partition down the middle. On one side of this partition a heavy roller, which may weigh up to 4 tons or more, is mounted on horizontal bearings. This roller is equipped with steel bars called the beater bars whose edges are approximately $\frac{1}{8}$–$\frac{1}{4}$ in. in width. Underneath the roll and carrying its weight when running is a bed-plate, also armed with steel bars similar to those on the roll. When the trough is filled with a mixture of fibres and water and the the roll is allowed to rotate and is lowered slowly down on to the bed-plate, the fibres are subjected to a very considerable mechanical action between the bars on the roll and the bars on the bed-plate. Very large forces are generated and a considerable amount of mechanical energy is put into the action on the fibres.

What precisely happens is still the subject of considerable argument among experts, but the effects are as follows:—

(1) As the roll rotates and the stock is circulated round the trough, a certain number of fibres during the course of each second will be subjected to a cutting action and will be divided into two or more parts. Since the fibres are very small compared with the dimensions of the metal bars only a proportion of fibres during each pass through under the roll will be affected in this way. Consequently, as time goes on, more fibres will be cut and the average fibre length of the mixture will slowly be reduced.

(2) Apart from the action of cutting the fibres in two, there will also be mechanical attrition and damage to the surface of the fibres and to the ends of the fibres. In some cases, on examining the fibre under the microscope, frayed ends may be observed, but there is a large amount of effect on the surface of the fibres which is not readily observed under the microscope and which is generally termed fibrillation.

These two effects go on simultaneously, but not to the same extent in all cases. For example, if the beater bars are sharp then there will be more cutting action in a given time; conversely, if the beater bars are blunt and rounded there will be less cutting action and more bruising and fibrillation in a given time. Also the velocity at which the roll turns has an effect, as does the concentration of fibres in water. The more dilute the concentration the greater will be the cutting effect, and the more concentrated the suspension the greater will be the bruising or fibrillating effect.

Added to these variables is the fact that the original fibre and the cooking process to which it has been exposed in the pulp mill also have a considerable influence on the rate of cutting and fibrillation. It is by playing upon all these variables that the papermaker is able to meet so many different specifications.

Whilst it is not possible in a short space to give a detailed account of beating, the following points may be noted.

(1) The length of the fibre is important because it has a considerable effect on the formation of the sheet. The papermaker may, therefore, have to shorten his fibre length to suit the type of paper being made and may also have to shorten it to suit the type of paper machine upon which he is going to make it. When only cotton and linen were available to the papermaker, shortening the fibre length frequently had to be done in the beater, but this necessity is often obviated nowadays by purchasing a certain proportion of short fibres, usually in the form of hardwood pulps such as birch or aspen.

(2) The degree of fibrillation required will often be determined by the strength characteristics required in the paper, since the greater the fibrillation the greater is the bonding effect between the fibres when the sheet of paper is dried.

(3) If the fibres are cut with sharp beating tackle rather quickly, so that there is minimum time for fibrillation, then the stock is described as "short and free" and will give a sheet of very good formation but relatively low strength because there is little binding power between the fibres.

(4) If the fibres are beaten until they are very considerably fibrillated or "wet", and at the same time the fibres have been considerably shortened in average fibre length, then a stock is obtained which is short and wet. This will make a very dense sheet, which is quite strong so far as tensile strength is concerned but of a low tear strength.

(5) If the fibre is given careful beating, so that considerable fibrillation takes place but the fibre length is not shortened more than the absolute minimum, then a dense, strong paper is made which also has a high tear strength.

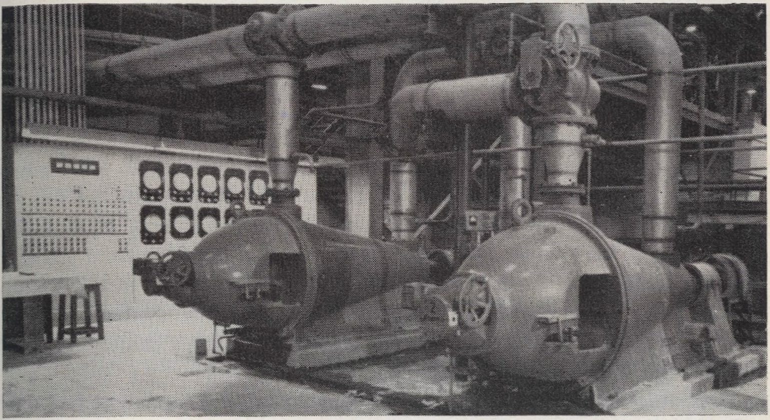
(6) If the minimum beating is given to the fibre, so that the length is not shortened and not much fibrillation takes place, then the formation may be very wild and the strength may not be very great.

Generally speaking, in recent years there have been two trends visible in beating. The first is that, with increasing speeds and with increasing attention being paid to costs, more paper is being made nowadays which has the minimum strength for the purpose in mind. There are many such papers where the main interest to the the user is in surface texture, smoothness, colour, etc. and the strength is a secondary consideration.

The second trend is towards increasing "tailor making" of furnishes. Whereas the old style papermaker only had cotton and linen fibres available and had to make everything from them, the present day papermaker has a variety of fibre species, several types of pulp cooking processes available, and a large number of individual pulp brands from which to choose. In consequence, the furnish is carefully chosen to require the minimum of action in the paper-mill to achieve the necessary finished properties.

Refining

The traditional Hollander beater mentioned above has been largely superseded by a type of machine in which a conical plug, armed with bars similar to beater bars, rotates within a conical housing also armed with bars. As the one cone rotates within the other the stock is pumped through the annular space and is subjected to a very similar action to that of the Hollander beater. This type of machine is loosely referred to as a refiner, and in a further development the working surfaces may consist of two discs rotating in opposite directions.



Conical Refiners.

The principal benefits derived from the use of refining engines are that firstly, they can be operated as part of continuous systems whereby the stock is pumped from one refiner to the next and then straight to the paper machine, and secondly by their design they are inherently more likely to wear evenly and to produce uniform stock throughout their working life. Furthermore, it is possible to control much more precisely the amount of action carried out on the fibres by measuring and controlling the energy input to the refiners.

However, a given refiner set-up is rather less flexible than the Hollander beater and therefore cannot be used to do such a wide range of papers.

Sizing (Engine)

Although, as mentioned above, a wide range of properties can be conferred upon the paper by choice of fibres and by beating, a yet further range of properties can be conferred by adding extra materials to the fibre mixture.

The most notable additive is rosin, which is added to control the penetration of water or ink into the sheet so that it is possible to write upon it. In the absence of such an additive any writing would spread widely, feather and become blurred.

Rosin is a water-insoluble and water-repellent material prepared from the natural resins to be found in certain pine trees. It has been found possible to render this rosin into solution with the use of alkalis, or to make an emulsion in water with the use of some alkalis and some emulsifying agent.

Such a solution or such an emulsion can be added to the fibrous stock at any stage before the paper machine, and is precipitated on to the fibres with the aid of papermakers' alum. This is aluminium sulphate, and, if the correct amount of rosin and the correct amount of alum have been added, the rosin is then present in the sheet in a suitable form to allow a certain penetration of ink into the sheet, but not too much, so that a good written line can be obtained without feathering.

It is important to note that the presence of alum makes the paper acid. Hard sizing of the paper can be readily obtained with rosin if enough alum is used to give an extract pH in the paper of 4.5. If, however, for reasons connected with the end use, the pH of the paper must be higher than this (*i.e.*, more alkaline) then greater care and attention have to be given during the making of the paper. There are now, however, types of rosin emulsion and other sizes on the market which allow good sizing of paper under neutral conditions, where this is absolutely necessary.

It should be noted here that the presence of the correct amount of rosin in the paper does not itself ensure that the paper will be properly sized. The drying of the paper plays an important part in the final effect, and the ideal situation is one in which the paper is dried on cylinders whose temperature increases slowly over the first few cylinders. If the wet sheet containing rosin size is subjected to drastic heat, then there is a tendency for the sizing to be destroyed.

Adequate sizing of paper is also required in all those cases where the paper is going to be coated with an aqueous mixture after manufacture, for in these cases an unsized web of paper would absorb the coating too quickly and would produce various undesired effects.

Loading

Paper made from fibre alone is frequently not sufficiently opaque for some of the purposes to which paper is put. Obviously a good-quality printing paper which is going to be printed on both sides needs to have a good measure of opacity.

Considerable control over opacity can be achieved in the beating stage, for a highly beaten sheet tends to be transparent, and a sheet in which the fibres are chopped up and little beaten tends to be opaque. There is, however, a limit to the degree to which one can control the opacity of paper in this way, for there are many other properties to be achieved in the sheet and consequently the papermaker frequently has to resort to the addition of white pigments to increase the opacity of the web. These may be divided into the relatively cheap low-refractive index pigments such as china clay and chalk, and the relatively expensive high-refractive index pigments such as titanium dioxide and zinc sulphide. Usually, where the amount of opacity required is not very great, china clay is used, and it is possible economically to use considerable quantities, because it is much cheaper than the fibre furnish. However, its opacifying power is limited and, where a more opaque sheet is required, then, of course, titanium dioxide is used. This, however, should not be used unless absolutely necessary, because it is considerably more expensive than the fibre it replaces and it also creates a problem with the effluent from the mill.

China clay may also be added for other purposes, such as to produce a better printing surface and a more uniform appearance. In some cases, where the final strength of the sheet is not of importance, quantities of china clay may be added to lower the overall cost of the furnish.

It is important to realize that the addition of loading has the effect, other things being equal, of reducing the strength and, if a strength specification has to be met as well as an opacity one, it may be necessary to use a more expensive fibre furnish to get the necessary strength.

Other Additions

A number of other items may be added to the stock. Among the most important of these are dyestuffs and pigments to obtain the necessary colour.

With some types of paper, additions of starch may be made to the fibre furnish to increase the strength. It is often cheaper and more convenient to do this rather than to use a stronger fibre furnish or more beating.

Wet strength resins are another category of materials that may be added to the fibre furnish. These are usually either a urea-formaldehyde resin or a melamine-formaldehyde resin and confer the property of strength to the paper when it is wet. They require the presence of a certain amount of acidity in the sheet and an adequate amount of heating during the drying of the paper in order to cure the resin and to develop the strength.

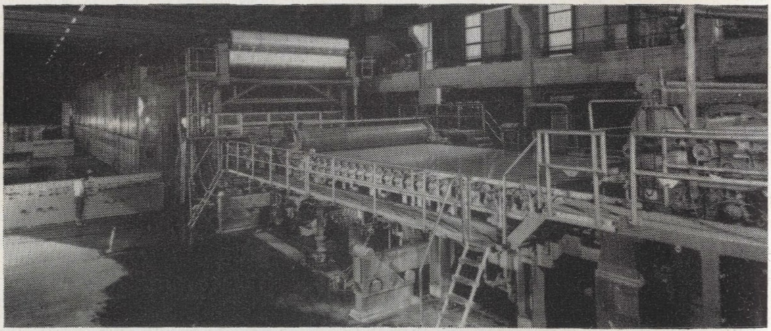
In many modern mills most of the materials mentioned above which can be added to the fibre furnish are added by continuous flow methods to the furnish as it is pumped towards the paper machine. Such continuous methods lend themselves to more precise automatic control and usually show a saving in operating costs.

5. Making on the Machine (Fourdrinier)

It is usual to have one or more large chests just before the paper machine which receive the stock from the pulp preparation equipment. In the older mills this chest usually receives the complete stock—*i.e.*, the fibre and all the additives. But in some cases nowadays some of the additives are added after this chest and just before the headbox of the paper machine.

The stock is pumped from the chest towards the paper machine and is diluted with backwater coming from underneath the machine wire. It then usually goes through some form of centrifugal cleaning device to take out particles of dirt, and may also, in the older machines, pass through a strainer which is intended to keep back knots and lumps of fibre, though it also has a valuable action in preventing flocculation of fibres. The stock then passes to the breast box of the paper machine, which is a construction varying very much in design from one machine to another but the essential function of which is to take the stock flowing through a pipe and to spread it out uniformly across the full width of the paper machine. The stock at this point consists of approximately $\frac{1}{2}$ to 1 per cent. of fibre, the rest being water. The stock finally flows out in a uniform sheet from the lips of the breast box or from under the slices, according to the design, on to the horizontal woven wire cloth.

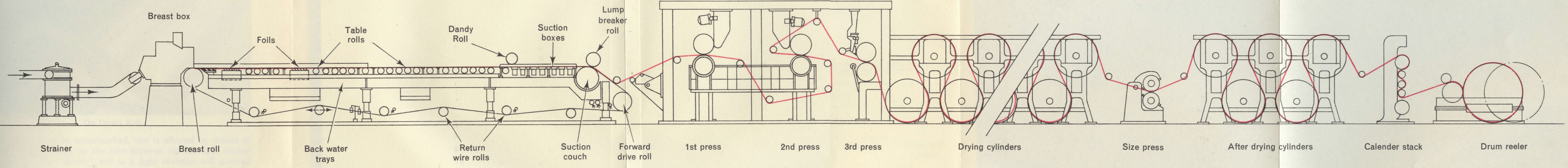
This wire cloth consists of an endless belt woven of phosphor-bronze wire with 60 or more meshes to the inch, through which the water can drain, leaving the web of felted fibres on the top. The wire cloth is supported in a horizontal plane by a number of rollers along which it moves, and passes back underneath the machine supported by a number of return rolls. Endless rubber straps called deckle straps, which are adjustable in or out according to the required width of the finished sheet of paper, are run along both sides of the wire to prevent the stock from flowing out over the edges.



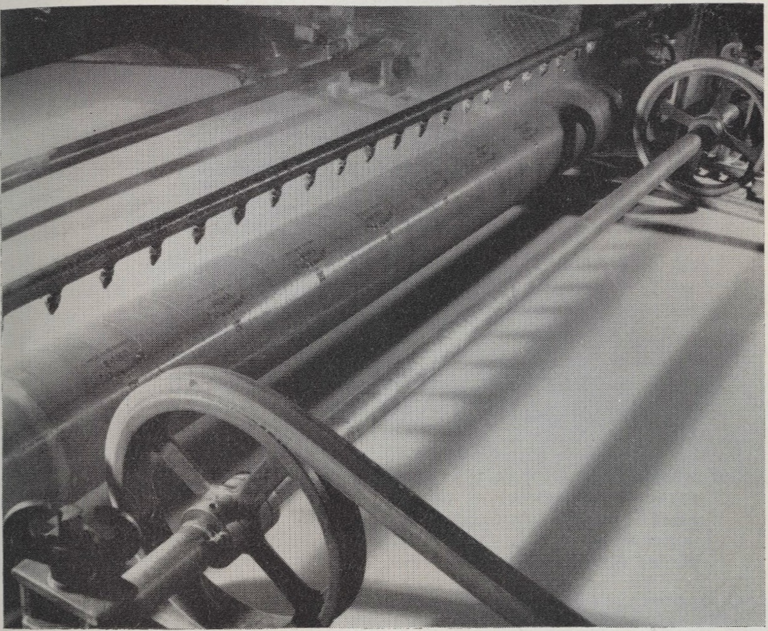
Wire End of the Paper-Making Machine.

In order to ensure that the fibres bed down well together and produce a good formation, the frame carrying the wire is given a shaking motion to a greater or lesser extent. On very fast machines this shaking motion may be dispensed with.

Paper Making Machine


Breast box
Foils
Table rolls
Dandy Roll
Suction boxes
Lump breaker roll
Strainer
Breast roll
Back water trays
Return wire rolls
Suction couch
Forward drive roll
1st press
2nd press
3rd press
Drying cylinders
Size press
After drying cylinders
Calender stack
Drum reeler

The wire cloth is supported on the frame on tube rolls of brass, which also help to remove water from the web by a hydrodynamic action. Towards the end of the wire frame, when water no longer drains out naturally, there are usually several suction boxes in which a greater or lesser degree of vacuum is maintained by means of a pump. This vacuum helps to remove more water from the web.



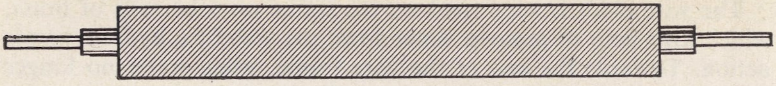
The Dandy Roll.

If the paper is to be watermarked, this is effected by means of a "dandy" roll running on the wire between the first and second suction boxes. The "dandy" roll is a light skeleton roll covered by a wire-mesh cloth similar to the wire of the machine. Copper wires, in the shape of the watermark required, are fixed to the cover of the dandy roll, and these raised wires impress themselves upon the wet web and push aside some fibres to form the pattern of the watermark.

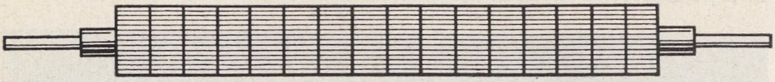
A wire-mesh covering to the dandy roll gives a "wove" paper: a laid paper is produced by a dandy covered with laid wires running horizontally and held in place by circumscribing "chain" lines.

The primary function of the dandy roll is to "close the sheet" or to flatten the rough surface of the pulp. The kind of covering on the dandy produces the "look-through" of the paper.

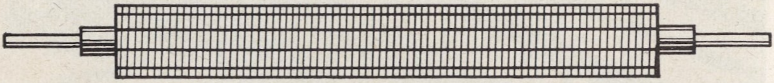
Having passed the suction boxes, the wet web, still on the wire, goes between the "couch rolls" where more water is squeezed out.



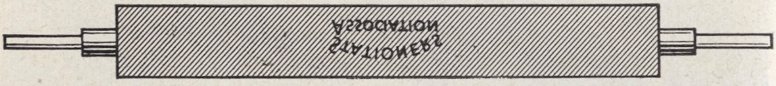
(*a*) Wove dandy covered with wire-cloth woven in a loom.



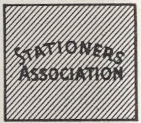
(*b*) Laid dandy with cover laid so many longitudinal wires per inch, secured by chains or twists about 1 in. apart.



(*c*) Spiral-laid dandy with cover formed by a spiral wire wound from end to end at specified pitch, secured by longitudinal wires soldered about 1 in. apart.



(*d*) Wire or electrotype marks affixed on any type of dandy make an impression or thinning of the pulp. Watermarks are thus produced, showing a light mark in the paper when held up to the light, or a dark mark when placed on a dark surface.

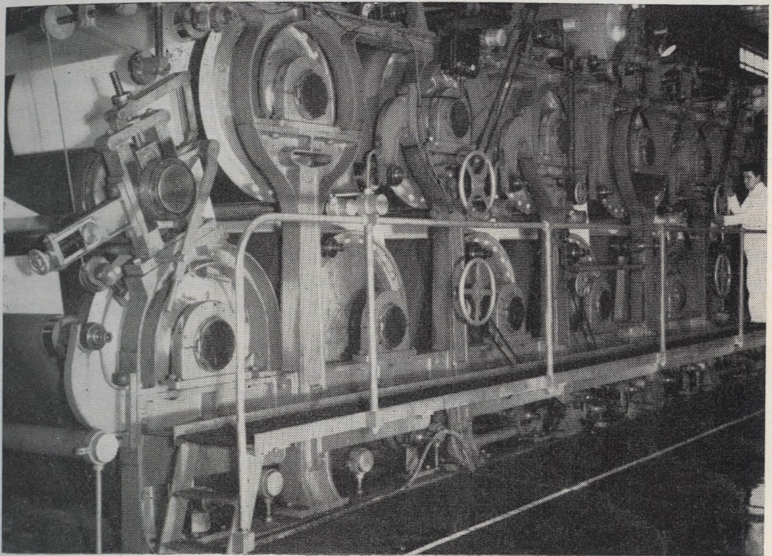


Diagrams of Dandy Roll and Watermark.

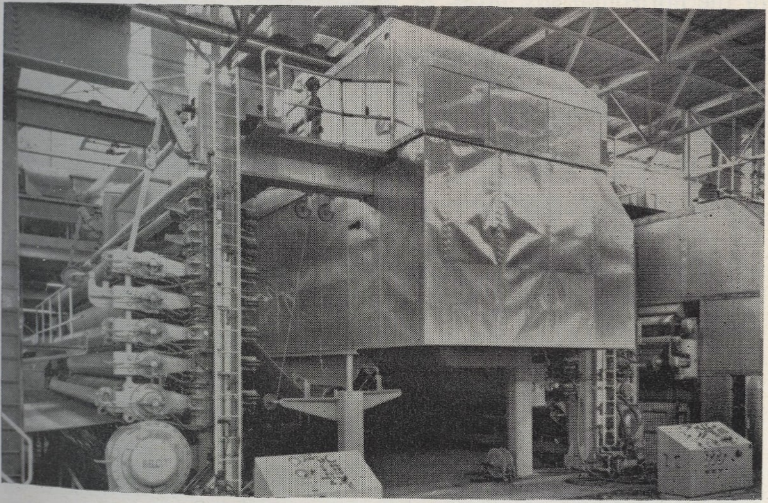
In some modern mills a suction couch is used instead of a pair of couch rolls. The web of paper is then just strong enough to support its own weight and at this stage it is transferred from the wire to a woollen felt called a "wet felt." While supported on the wet felt the moist web of paper is passed through a pair of press rolls, the top one usually of polished granite and the bottom one rubber covered, in order to extract any surplus water and also to consolidate the sheet. On large machines there may be up to four pairs of press rolls.

After the press stage it is not possible to squeeze out any more water by mechanical means and so the web, which still contains about 2 parts of water to 1 part of fibre, is passed over steam-heated and polished drying cylinders. The paper is held against these cylinders by cotton, woollen or terylene felts, this time called "dry felts," to prevent it from shrinking and cockling.

When it is dry the paper may be passed through a series of "calenders" to put a machine finish on it. These calenders consist of a stack of 5, 7 or 9 polished chilled-iron rolls which are sometimes steam-heated. After calendering, the paper is passed over a pair of cooling rolls to be wound continuously on the "reel-up."



Dry-end of the Paper-Making Machine.



Calendering Station.

6. Surface Treatment, Drying and Moisture Control

Tub Sizing

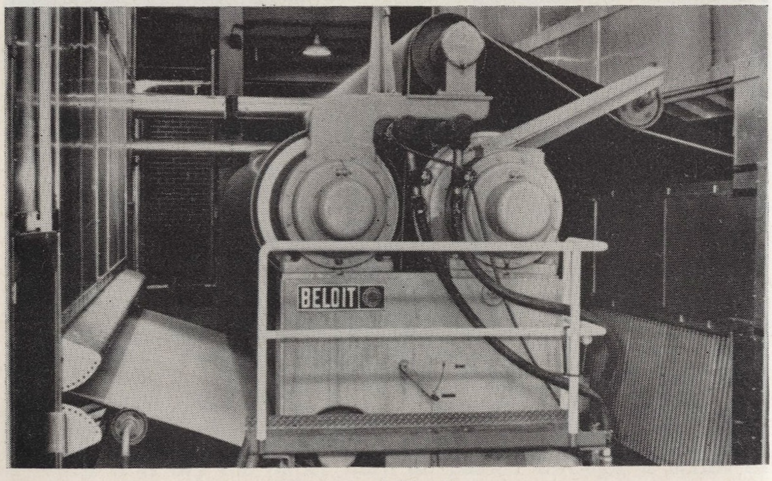
Before the days of rosin sizing, paper had to be sized with animal glue or gelatine in a separate operation in which the paper web was unwound through a bath of glue, dried and subsequently re-reeled. This type of operation is still carried on in a few cases. In some other mills the tub size bath is attached directly to the end of the paper machine and, of course, runs at the same speed as it.

When operating on gelatine, the bath may either be operated hot in order to get the gelatine into the paper, or be operated cooler, perhaps with the addition of some alum, in order to get a skin of gelatine on the surface of the paper. In either case, the paper, after passing through the bath, goes through a pair of squeeze rolls to remove surplus liquid. It may be subsequently reeled up damp so as to allow the gelatine to soak in, or it may be immediately dried on air dryers or steam-heated cylinders.

The total tonnage of paper treated in this way is now relatively small, and a very much larger tonnage is given a surface treatment on the paper machine by a device known as a size press.

Size Press

A typical size press consists of a pair of rolls placed either one above the other or in a horizontal plane forming a nip through which the paper passes. Arrangements are made for the paper to be wetted just before it passes into the nip, and this may be carried out either by spray pipes wetting both sides of the web, in the case of the horizontal size press, or by the lower roll of a vertical size

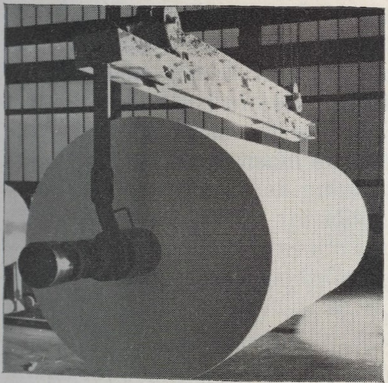


Horizontal Size Press.

press dipping into a bath of size and thus wetting the underside of the web while the top side of the web is taken care of by means of spray pipes.

In either case the quantity of liquid transferred to the sheet is quite small and the time of wetting is quite short. Nevertheless important and useful effects are obtained by this equipment. Since the web has been rewetted there must be some drying capacity after it, to complete the drying of the web, and usually this consists of somewhere between three and seven drying cylinders.

Most commonly a size press is used to apply a starch solution to the surface of the paper in order to strengthen the bonding of the surface fibres and make them more coherent. This is of considerable importance to certain classes of paper such as offset lithographic paper. Since starch is relatively cheap compared with fibre, valuable surface properties may be conferred with very little, if any, additional cost. Another function of the size press may be to add colouring matter to one or both sides of the web or, in some cases, to adjust for the two-sided colour effects which are produced at the wet end of the paper machine. Yet another valuable function of the size press is to control a curling characteristic of the paper, because it is, on the whole, easier to dry the paper well down on the main bank of cylinders, rewet at the size press and then exercise careful drying control on the last bank of cylinders in order to obtain a flat-lying sheet of paper.



A Reel of Finished Paper.

General Comments on Drying of Paper

As mentioned earlier, the function of the steam-heated drying cylinders is to dry the paper free from cockling. This is achieved by virtue of the fact that the drying web is held against the cylinders by means of the dry felts. This does not prevent some shrinkage of the web, and in fact the web shrinks in the cross direction to an appreciable extent during the course of the drying operation. The more the paper is beaten the greater is the generation of shrinkage force and the more difficult it is to prevent the shrinkage taking place. Correspondingly, it is more difficult to prevent cockling occurring during the drying operation.

This shrinkage of the web creates certain properties in the paper, notably the tendency of paper to expand when the moisture content is increased or when the paper is placed in an area of higher humidity. As a rough working rule it may be stated that the more a paper has shrunk during drying the more it will expand on rewetting or being subjected to high humidity.

It follows, therefore, that if a paper is required with minimum dimensional change in humidity, then minimum shrinkage should take place in manufacture. This means that the paper must be of the free beaten type, and will probably have a fairly low strength.

Since the shrinkage of the web during drying is being to some extent inhibited by the dry felts holding the web against the cylinder, it follows that the deckle edges of the sheet must be relatively more free to shrink. This means, therefore, that paper as made normally has a greater degree of shrinkage at the edges and, therefore, a greater tendency to expand when moistened. These effects may actually become visible on occasions as cockled or grainy edges.

Since the wet web, before drying, has little strength or coherence, it follows that the development of fibre-to-fibre bonding takes place during the drying process. It has been shown that this tends to take place when the moisture content has been reduced to around 30 to 40 per cent. and it has been further shown that the tension in the web during the making process has an important influence on various properties of the sheet—in particular, the well known differences in strength between the machine and cross direction. These must be regarded as an inherent part of the paper-making process.

Moisture Control

The cellulose of which paper is made, is a substance which already contains some water. The amount of this water is determined by the amount of moisture in the surrounding atmosphere, provided that the paper has had sufficient time in that atmosphere for equilibrium conditions to be attained.

There are several important points to bear in mind here.

(1) Paper cannot be obtained under normal conditions without some moisture being present.

(2) The amount of moisture present determines in large degree the properties of the paper.

(3) When paper is moved from an atmosphere of one humidity to that of another humidity, it will commence to take up or lose water, but will take some time to establish a new equilibrium.

When these facts are ignored, as, for instance, when a pack of paper which is fairly dry is taken into a moist atmosphere, then moisture starts to penetrate the pack at the edges and, as the moisture content of the paper goes up, so it expands. The only way it can effectively expand under these conditions is to go into a wave or sinuous curve. This is the well known effect called "wavy edges."

The ideal situation would be for the atmospheric conditions under which the paper is going to be used to be accurately known to the papermaker and for him to make the paper and supply it at that moisture content. Needless to say, this situation can rarely be achieved except in the case of certain speciality papers, and some compromise is necessary.

On the whole, it seems to be better to supply paper in equilibrium with an atmosphere somewhat dryer than that in which it is most likely to be used. Assuming that in the British climate one is most likely to encounter an atmosphere of 65 per cent. relative humidity, then a paper supply in equilibrium with about 55 per cent. relative humidity will be most suitable.

It should be noted that it is more useful to speak of the atmosphere with which the paper in question would be in equilibrium rather than the actual moisture content of the paper. This is because the actual moisture content of the paper will vary for a given relative humidity according to the nature of the paper and the quantity of loading material added.

It should also be noted, however, that there is an increasing tendency for fully heated workshops in British industry. This means that lower relative humidities are now being encountered, particularly in the winter, than previously. The paper manufacturer and paper consumer should, therefore, try to co-operate so as to ensure that the best possible moisture content is being provided.

Where only small quantities of paper are being stored in an unheated place, it should be remembered that the temperature during the winter will fall nearly to the prevailing outside temperature during the course of the night. When this happens the amount of moisture in the air remains the same, but the relative humidity increases sharply and frequently reaches 100 per cent. Under these conditions the paper takes up more moisture from the atmosphere and will become damper and easily exhibit such features as wavy edges.

The effect of temperature should be remembered by all those who handle paper packed for transit. When a pack of paper arrives at the consumer's warehouse or workshop it may have spent several days in transit and, if so, will have attained the prevailing outside temperature, which in the winter may be very low. If this paper is immediately unpacked, then atmospheric moisture will commence to condense on it because it is so cold, exactly as it would condense on the outside of a glass of cold water. The only difference is that nothing can be seen of this condensation except the expansion effects, such as wavy edges, that it produces. Packs of paper should, therefore, be allowed to attain the temperature of the workshop before being opened.

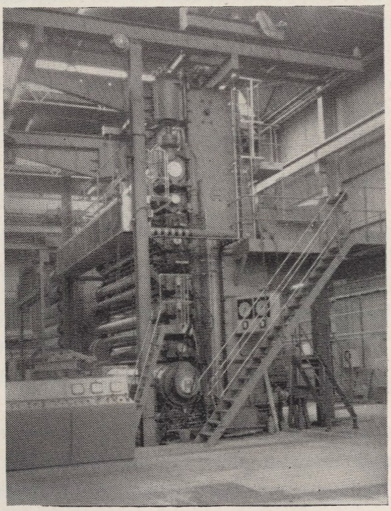
Better control over moisture content is being achieved by the papermaker by the use of more up-to-date machinery and various types of automatic control equipment. Size presses frequently play a valuable part in achieving correct moisture content, since it is easier to overdry the paper on the machine and then to remoisten it under control.

The old method of conditioning paper by passing it round spar drums in a moist atmosphere, and then re-reeling and allowing it to stand for some considerable time, is not usually practicable nowadays for most papers, owing to cost and output considerations.

7. Finishing and Quality Control

Super-Calendering

For some purposes the calendered finish obtained off the paper machine is insufficient and the reel of paper is passed through another calendering operation in which it passes between alternate rolls of steel and compressed cotton. Although the compressed



A Ten-Roll Super Calender.

cotton roll appears to be quite hard it has some resiliency, and the resulting effect on the paper is to give it a superior smooth surface. The resulting finish can be controlled by varying the number of rolls between which the paper passes, by varying the degree of pressure between the rolls, and, to some extent, by varying the moisture content of the paper.

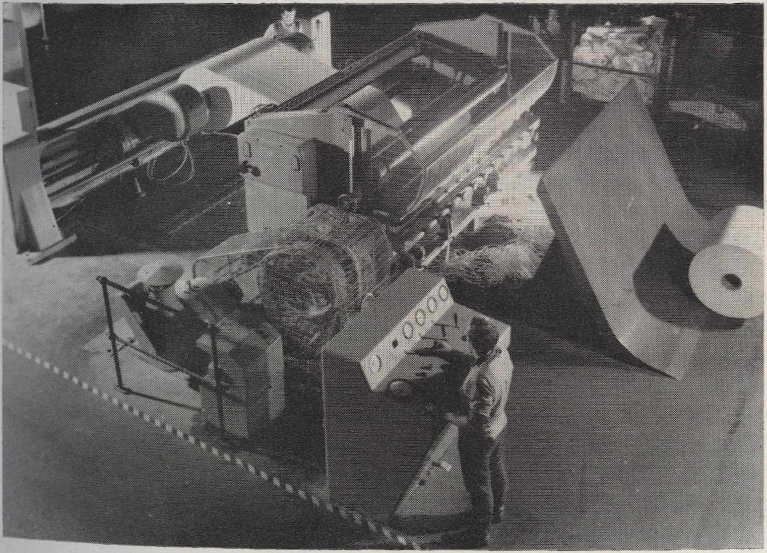
A special type of super-calender is used with a very heavy line pressure and extra heating for producing the type of transparent paper known as glassine.

Embossing

Certain papers can be given a special finish by passing them through an embossing calender. This consists of a backing roll against which runs a hardened steel roll embossed or etched with the required design. Provided that the paper has the correct moisture content and the correct pressure is used, this embossed design will be transferred to the surface of the paper. Various decorative effects can be obtained in this way.

Slitting

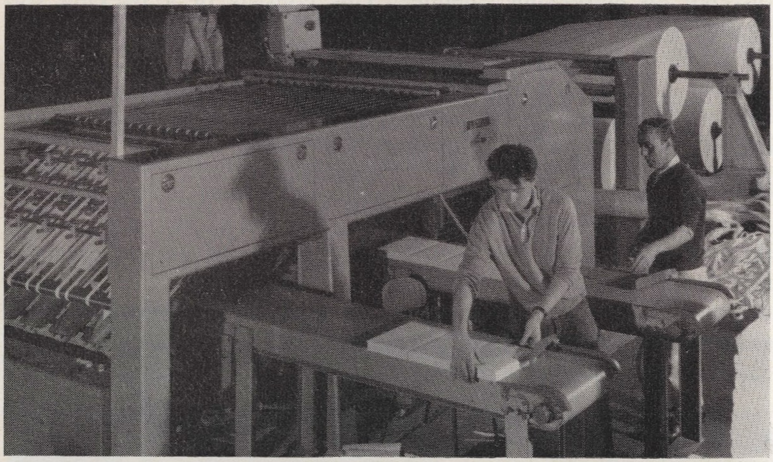
Paper may be required by the customer in reel widths smaller than those manufactured, and the reduction is carried out in machines fitted with circular revolving knives. The narrower the rolls required the more care has to be taken in this operation, the most extreme example of this being the preparation of very narrow rolls or cheeses of thin cigarette paper.



Slitting and Rewinding.

Cutting

Much paper, of course, is required cut into sheets; this is done on a machine known as a cutter, which can usually be fed with more than one reel at a time so that several sheets are cut at each cut. A simplex cutter has one rotary shaft with one or two knives fixed to it so that the sheets from the reel being cut are all of the same length. A duplex cutter has two rotating shafts with knives fixed on to them to make it possible to cut sheets of two lengths from the same reel. This type of cutter is often important in that it allows the maximum utilization of machine widths or deckles.



Sheeting and Slitting Cut Paper.

An angle cutter is one in which the knives can be set at an angle to produce a sheet of diamond shape, this being required for the more economical production of envelopes.

In certain better qualities of paper there may be a call for paper cut to register. This means that the complete watermark should be exactly in the centre of each sheet, and to do this only one reel at a time can be cut. In the more modern mills photoelectric equipment may be used to control the action of a cutter to get a more precise cut to register.

The Salle

After cutting, the paper is taken to the sorting room, known as the salle, where women sorters overhaul each sheet. The intention is to remove sheets that are too dirty and those that are torn or creased. These are returned for repulping.

The Salle.

The good paper is then counted, either by hand or by an electronic counting machine, into reams, formerly of 480, 500 or 516 sheets but now mainly of the standard 500 sheets.

Inspection of every sheet is obviously a very expensive process and is being increasingly eliminated, particularly for the less costly grades of paper.

Quality Control

Paper has, of course, been subjected to various tests for many years, but in recent years in the more advanced mills the testing of paper has been placed on an organized footing in a department known as the quality control department. In this department testing schedules are worked out appropriate to the end use of the paper concerned, and quality control limits are set for the making department to observe. These limits are normally tighter than the quality control limits agreed with the customer. It is important to realize that the presence of a quality control department in a production unit does not mean that no paper will ever be made and sent out below the required standard. But it does mean that sensible standards can be agreed between the customer and the manufacturer. It also means that, in agreeing what the quality standard should be, the true cost of any particular quality standard can be made known to the customer, so that he is fully aware of the implications of any particular standard he may ask for.

The physical properties of paper are subject to considerable random variation due to the action of a large number of different causes right the way through the process, starting from the raw material. Consequently, a statistical approach is taken to the subject of testing, which generally means that a paper is considered satisfactory if there is a 95 per cent. probability that any test result will fall within the agreed limits.

8. Coated Paper

A considerable quantity of paper (and board) is coated, usually with a mixture containing pigments, either during manufacture or afterwards as an entirely separate operation. In the first case this is known as "on machine" coating and in the second case as "off machine" coating.

The main purpose of coating paper is to create a special surface on one side (or, in some cases, both sides) of the paper. Usually, this special surface is there to make the paper smoother and more receptive to a printing operation, though in other cases paper may be coated merely to colour it.

The simplest type of coating mixture consists of a pigment (most often china clay), a binder and a vehicle in which the other two constituents are suspended. The most common binders in use are starch, casein and gelatine and, of course, the most common vehicle in use is water.

Where a coating is carried out using a vehicle other than water, this is usually called lacquering or varnishing and generally involves the use of fireproof equipment.

The binder plays a very important part in the coating mixture, since it keys the pigment particles together and causes them to adhere to the base paper sheet. Too little binder or too weak a binder will cause the pigment to rub off or flake off, whereas too much binder may reduce the opacity or reduce the absorbency too much, thus affecting the printing qualities.

Many coating processes have been used, but they all require the following steps to be carried out:—

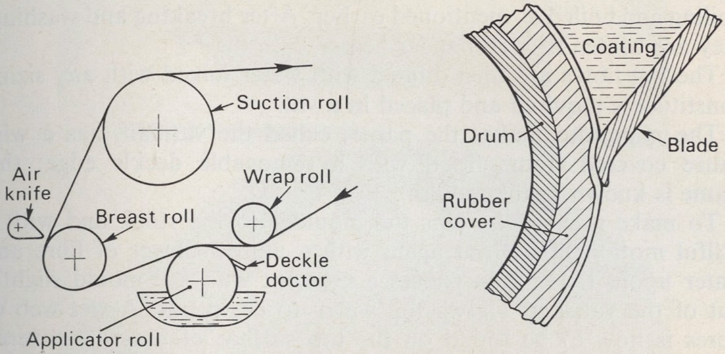
(1) Applying the coating mixture to the surface of the paper.
(2) Measuring by some means the quantity of coating applied.
(3) Smoothing out the coating to a uniform layer.
(4) Drying off the vehicle.

Types of Coaters

An early and very popular type of coater was the brush coater. In this machine the coating mixture was applied to the paper by means of a roller applicator, after which a series of brushes mounted on bars across the width of the paper oscillated and smoothed out the coating. The paper was then usually dried in what is known as a festoon dryer, in which the paper was made to hang in loops and moved slowly along in a current of warm air until dry. In this way nothing touched the coated surface of the paper until the paper was fully dry.

A later type of coater consisted of a series of rolls on which the coating mixture was transferred from one to another, finally reaching an applicator roll from which it was transferred to the surface of the paper. This type of coater (Massey coater) had the advantage of coating very much faster, and it could also be operated both as a separate coating machine and as a coating head on a paper machine.

There were a number of variations on the roller coating theme, and these have now tended to be superseded by the trailing blade coater. In this coater, a coating mixture is applied to the coater either from a "pond" or from an applicator roll, and the excess is then scraped off by a flexible blade held against the moving paper. This type of coater can be operated with a much higher solids content coating mixture, which means that very much less water has to be evaporated during the drying stage.



Two Methods of Coating
(*a*) Air knife. (*b*) Trailing blade.

A further principle widely used is that of the air knife. In this coater, an excess of coating is applied to the paper from an applicator roll and the excess is then doctored off by means of a thin high-velocity jet of air, extending across the full width of the web and known as the air knife.

All these types of coating machine, and a number of others which there is not space to mention, have their own peculiarities and advantages and disadvantages. For instance, the air knife can be made to operate very fast and will give a reasonably smooth surface which, however, tends to follow the undulations of the base paper, whereas the trailing blade coater, which can also operate very fast, gives a surface which is scraped off level—*i.e.*, not following the undulations of the paper base.

The physical properties of the base paper are important in coating, and set certain limitations on the kinds of paper that can conveniently be coated.

Since the most common form of drying after a coating operation is to pass the paper through a tunnel in which the paper is dried by warm air or, in the case of older coaters, a festoon dryer, it is important that the base paper should be of such a character that it can be dried without excessive cockling. This sets a limit to the wetness and degree of beating which can be tolerated in the base paper.

9. Hand-made Paper

Very little hand-made paper is now made in this country, but there is still some demand for it for special purposes. The following is a brief description of the process.

The best-quality linen and cotton rags are used, care being taken to see that they are free from synthetic fibres. After sorting to remove contraries and dusting, the rags are cut up to a suitable size for boiling and boiled as mentioned earlier. After breaking and washing, they are beaten in a Hollander beater.

The rag fibres are then diluted with water mixed with any sizing constituents required and placed in a vat.

The man who makes the paper, called the vatman, has a wire gauze covered frame fitted with a removable deckle edge; this frame is known as the mould.

To make a sheet, he dips the mould into the stock and with a skilful motion lifts it out again with a uniform layer of fibre and water upon it. He then pauses a moment with the mould slightly out of the vat, and allows the water to drain out. A wet web of fibres is now to be found on the top surface of the wire-covered mould. The vatman removes the deckle from the frame and, after allowing more surplus water to drain from the mould, he inverts it on to the top of a pile of damp felts or blankets. With a deft rolling motion he lifts the mould from the felt, leaving the wet sheet behind. Further pieces of damp felt are placed on top of the pile, and another sheet is made and transferred to the top of the pile. This act of transferring the wet sheet is known as "couching."

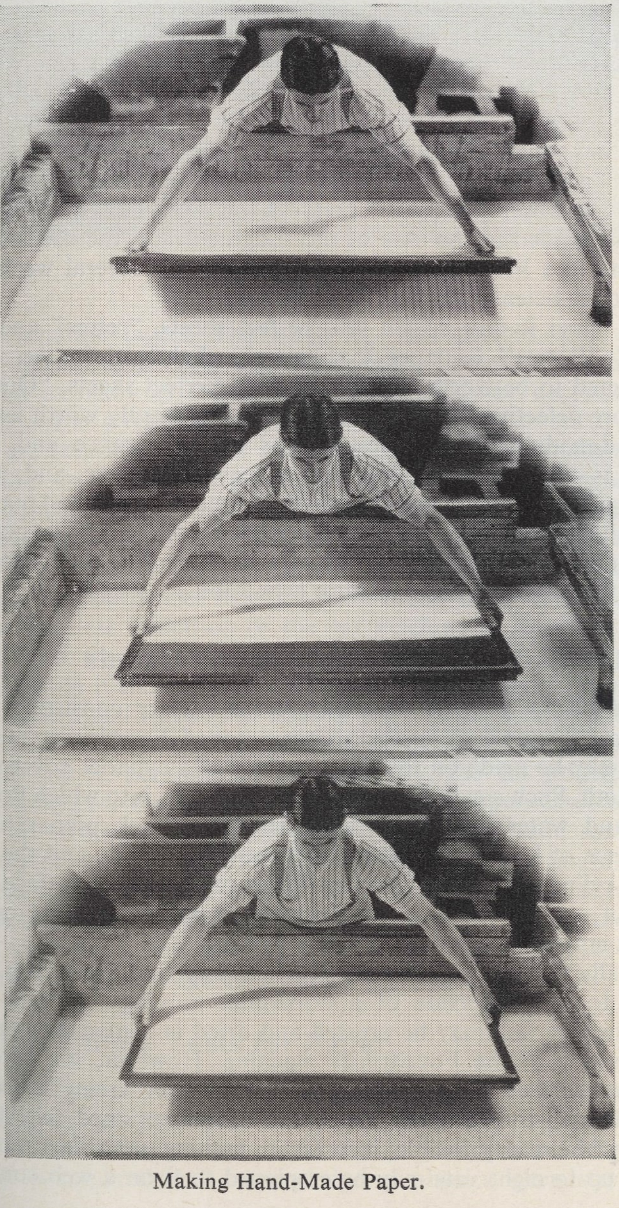
Ultimately a pile is produced consisting of alternate sheets of wet felt and wet paper. This pile, called a "post," is then transferred to a hydraulic press and excess water is slowly squeezed from the pile under considerable pressure.

During this process the paper tends to take on a grainy surface corresponding to the pattern of the felts.

The sheets of paper and felt are now separated by a "layer", and the sheets of paper are built up into a pack without felts and pressed once again. After this the layer again separates the sheets of paper, and they go either for drying or for sizing.

Sizing of hand-made paper may be carried out by passing the sheets one by one through a bath of hot gelatine solution. On emerging the sheets are passed through pressure rollers which squeeze out the excess size.

The old method of drying hand-made paper, whether sized or unsized, was by "loft" drying. In this method the sheets of paper were hung up on lines in a large and airy loft with many ventilating slots in the walls, and after two or three days the paper was dry.



Making Hand-Made Paper.

Alternatively the sheets could be dried on flat canvases stretched between trestles or on wooden poles. In either case the paper was free to shrink during drying.

Hand-made paper is finished in three surfaces, *hot pressed* (*or h.p.*) *not and rough.*

The term "hot pressed" is a misnomer, because heat is not now used in this process. To obtain the glossy surface associated with this description the sheets are laid alternately with zinc or brass plates and the wad of paper and plates is passed between rollers; as one roller goes faster than the other it creates a certain amount of friction which imparts the glaze.

The "not" surface is obtained by pressing one sheet against another and maintaining the pressure for several days. No pressure at all is applied in the case of the rough surface, the sheets merely standing in a heap under their own weight for several weeks until they are sufficiently flat and fit to be sold.

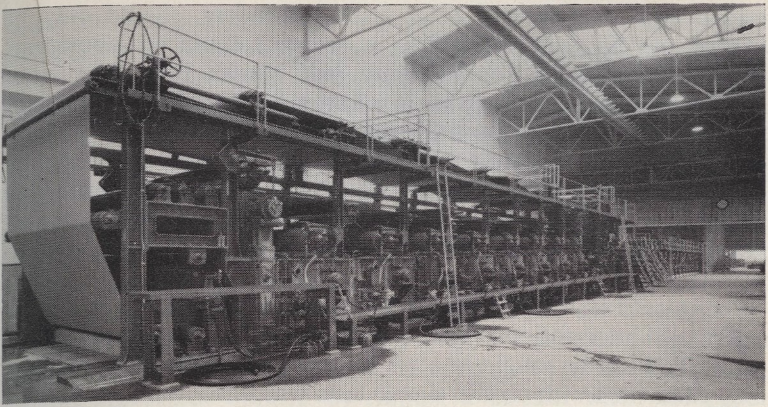
The paper is now sorted into perfect sheets, "retree" and "outsides." "Retree" is paper that is only slightly defective, and is considered to be worth slightly less than perfect sheets. "Outsides" are more defective than retree and are consequently worth less.

Hand-made paper, of course, has an appearance and handle which is very attractive for personal stationery etc. and, by the nature of manufacture and the length of time of drying and maturing, it is unlikely to undergo further changes on storage. Unlike machine-made paper, the strength is roughly the same in both directions, as are the humidity and moisture expansion.

10. Mould or Vat Made Papers and Boards

Instead of being made on a horizontal surface consisting of the moving wire mesh as in the aforementioned Fourdrinier machine, paper may be made on the outer surface of a cylinder covered with wire cloth. Such a cylinder is immersed in a vat, into which flows the fibre and water mixture coming from the stock preparation. A difference of level is maintained between the outside and the inside of the cylinder and, as it rotates, fibres collect on its surface in the form of a web which can be removed from the rotating cylinder after it emerges from the stock.

Usually the machine is arranged in a way that the web is transferred to the underside of a horizontal moving felt, and thereafter the wet web may be pressed and dried in a manner similar to that used with the Fourdrinier machine. However, the layout of the vat machine allows the possibility of transferring more than one wet web to the underside of the aforementioned felt. Consequently the vat principle is used in making multi-layer boards, where up to eight vats may be employed to form a web consisting



Cylinder Vat Machine.

of eight separate layers. The whole is then pressed and dried together. Such a multi-layer board may require considerable drying effort, and as many as 150 drying cylinders may be necessary to dry the board at a reasonable speed.

There are two basic types of vat, the uniflow and the counterflow, which differ in the relative directions of motion of the incoming stock and the rotation of the cylinder. Some differences are produced in the properties of the web by these two methods, which need not be gone into here. In general, the vat tends to produce a wilder sheet than the Fourdrinier machine, with rather more fibre orientation. The greatest limitation of the vat machine is, however, that of speed. Since the web is being formed on the outside of a rotating cylinder, clearly if the speed of the cylinder is increased to too high a figure, centrifugal forces will tend to prevent the web ever being formed. Thus, the top speed limit for such a machine would appear to be 400–500 ft. per minute. Consequently, the vat principle is used nowadays for the thicker materials and for those cases where there is an advantage in having several different layers, some of which may be made of inferior fibre—for example, box board.

Vat machines have been used for producing an artificial handmade “deckle” paper. This can be done by fixing strips around the forming cylinder which prevent fibres being laid down at that point, thus leaving a rough edge on the adjacent areas.

11. Some Simple Tests for Paper

The testing of paper for quality control, examination and determination of physical properties, chemical analysis of material, suitability for end use, etc., is a complex and highly skilled science. Special apparatus is required and a knowledge of physics, chemistry and mathematics is essential. Most testing therefore, should only be carried out by qualified staff in a properly equipped laboratory, which is controlled for humidity and temperature. The latter requirements are necessary as, in addition to the paper itself, many tests are susceptible to variations of these conditions.

To obtain the maximum value of any test, it is desirable that it be carried out to an agreed and accepted standard. Considerable uniformity of testing methods has been achieved by publication of standard methods by the British Paper and Board Makers Association (Technical Section), many of which are incorporated in the specifications of British Standards covering this field.

Detailed information of testing methods, as with paper technology generally, must be sought in other books of reference; this section is only concerned with certain simple tests which may be useful to the reader, and possible to carry out in the office or warehouse, as the occasion may arise.

Sense Tests

Outside of the laboratory, much can be learned about a particular paper by use of the senses, *i.e.*, touch, sight, taste and sound. For example, the "rattle" of a sheet will generally indicate its hardness and density. Fibrous content, sizing and loading are properties that will effect the rattle. A well beaten, hard sized paper should have a good rattle. Straw will produce a better rattle than esparto.

Tearing of the sheet will also indicate fibrous content. Esparto will tear easily and softly; wood free papers with more resistance and a harsh tear; rag papers with strong resistance and a loud tear. Machine or across machine direction can also be determined by tearing. A tear with the grain (machine direction) will be clean and direct; across the grain it will produce a rather ragged tear.

If the sheet is held up to strong light, the "look-through" will indicate uniformity of texture or structural appearance. According to how well the fibres are dispersed during paper making, they may or may not "flocculate," or mass together. "Flocs" will appear in the look-through if the fibres have not been well dispersed; well spread out fibres produce a "close" sheet, which is usually more desirable. However, a "wild" or flocculated sheet may indicate strength in the case of long fibres used for a strong wrapping.

Cleanliness, opacity, gloss, etc., can be judged by the eye; surface texture, substance, thickness and bulk by fingers and thumb. Degree of sizing may be ascertained by applying the tongue to one surface and noting the time it takes for the saliva to be absorbed.

The testing of paper by these methods allow immediate and local examination, which is essential to anyone handling or selling paper. Degree of accuracy will, of course, depend upon practice and experience. Since paper is handled frequently by most people, every opportunity should be taken to make these tests, particularly when there is a means of checking the assessment.

Instrument Testing

More accurate results may be obtained for some tests by the use of simple instruments.

Basis weight or substance can be determined by weighing on a quadrant balance. This is designed to weigh a whole sheet of the appropriate size; the pointer indicates ream weight on the quadrant scale. Thickness can be measured by a micrometer; from this the bulk (ratio of thickness to substance) may also be calculated.

Burst strength is a common strength test. It can be made by using a hydraulic burst tester. The paper is clamped over a rubber diaphragm. Liquid pressure is applied by turning a handle; when the paper bursts the pressure reading can be taken from a dial.

Tensile strength is measured by the force required to break a strip of paper when pulled longitudinally from each end. A strip of paper is fastened between clamps and subjected to a gradually increasing load until it breaks. Tensile strength varies in machine and cross-machine direction so it is necessary to test both directions.

Folding strength can be measured by an instrument that simulates the folding backwards and forwards of a strip of paper; the number of folds before breaking being carefully measured.

To measure tear strength, an instrument is used to tear a known length strip of paper by force, applied by a falling pendulum. Tear strength is important as it decreases with beating; other strength properties mentioned tend to increase with beating.

As with laboratory testing, these tests should be carried out under controlled conditions of humidity and temperature. Standard conditions in this country are 65 per cent. relative humidity at a temperature of 68° F. Similarly a large number of tests are necessary to obtain a reliable average.

Other simple tests that can be made easily and conveniently are as follows:—

Hand-made and Machine-made Paper

The presence of a deckle edge is usually taken to indicate hand-made paper, although of course this can easily be simulated. The most reliable method is to test the tensile strength in two directions at right angles to each other. In the case of machine-made paper, the machine direction tensile strength will be at least double that of the cross direction, whereas with hand-made paper they are more or less equal. In the absence of a tensile test machine, the expansion of the paper on wetting may be examined. To do this pairs of marks are made either with a sharp pencil or with a metal point, about 6 in. apart. After thorough soaking the distance between these marked points is measured again, when it will be found that in the case of machine-made paper the cross direction has undergone a greater expansion than has the machine direction. In the case of hand-made paper these two expansions are practically the same. This measurement has to be made carefully and it is better to do it with an accurate steel rule.

Sizing

The accurate measurement of sizing should, of course, be left to the quality control laboratory, but useful checks can be made in the following way.

On the paper surface to be tested, three or four parallel lines are drawn with a steel pen, using in one case an ordinary traditional blue/black ink and in the second case one of the penetrating types of quick-drying red ink. After blotting, in each case a second set of lines is drawn at right angles to the first.

On examination it will be found that, if with both inks the outlines of the lines drawn are sharp and clear, then the paper is very hard sized; if the penetrating red ink has feathered a little at the junctions of the lines, then the paper is still well sized; if both inks have feathered slightly, then the paper is unsized.

Detection of Top side and Wire side of the Sheet

Differences between the two sides of the sheet can often be shown up by the following simple test.

Since the two sides of a sheet are not identical, it may be necessary to tell them apart. In very many cases the difference is great enough for the wire side of the sheet to be readily detected by looking at the paper in slanting light. Where this cannot be told with certainty the paper should be soaked in water or in a solution of soda (sodium carbonate) for about 10 minutes, blotted off and allowed to dry. This treatment may accentuate the wire mark of a smooth paper sufficiently to determine which side it is.

In a watermarked paper the watermark itself can be taken as a guide, because this can normally be read from the top side of the sheet.

The top and wire side of the paper may be indicated by the manufacturer when the paper is packed. If this is the case, care should be taken when unpacking and handling the paper in the workshop or store to see that this information is not lost.

Colour

It is important that some attention should be given to the colour of paper, particularly in relation to the end use.

There are very many dyes and pigments available which are extremely fast to light and will not fade. However, it should be remembered that this property is one which has to be paid for, and it follows that a very large tonnage of paper is made with cheaper dyes which are less fast to light. This is perfectly satisfactory for many of the end uses of paper—for example, the documentation used in many factories, warehouses and offices relies upon having different colours for different copies. Often these copies have only an ephemeral life and therefore do not need expensive dyes.

Care should therefore be taken that papers of this kind are not used in situations calling for continuous exposure to light.

Where a doubt exists about a paper a rough test can be carried out by exposing the paper for several days to daylight, part being covered by a piece of black paper or other opaque material. Alternatively an ultra-violet lamp may be used for a shorter period of time. On examination, if the paper has faded at all the demarcation line can clearly be seen.

It must be remembered, however, that this kind of test is very rough and that proper fading tests can be carried out only in a well equipped laboratory.

Other simple tests affecting colour that may be carried out are the effect of water to see whether any soluble dye is leached out, and the effects of glues and pastes. The latter may either be acid or alkaline and thus have some effect upon the dyestuffs.

Loading

The only simple test that can be carried out here is to burn a piece of paper to see whether any loading is present. It is as well, at the same time, to burn a small piece of filter paper which is quite free from loading. When the two residues are compared it can easily be seen whether the paper in question has much loading.

Stretch

As has been mentioned earlier, the stretch on wetting or on exposure to high humidity is an important property. Ideally, one should always know which is the machine direction and which is the cross direction of the paper one is handling, but occasionally it may be necessary to carry out a spot check.

A simple way of doing this is to cut a circle from the sheet of paper, carefully marking it to indicate how it has been cut, and to damp it all over on one side. It will then curl up into a cylindrical shape, the greatest extent of curl being in the cross direction, which means that the axis of the cylinder will be lying in the machine direction.

It is important to make sure when different papers are united into one composite whole—as, for instance, when paper is made into a pad, perhaps with a cover on it—that the machine directions are all in the same direction. If the directions are mixed up then differential expansion will inevitably mean that either during storage or during use a wavy cockle will be set up.

12. Paper and Board Classification

Following the description of the manufacture of paper, the stage has now been reached when it is possible to make a closer study of some of the individual items that come within the classification of paper, and which are of particular interest to the stationer.

They will be dealt with in separate sections under the following headings.

(i) Writings—which include note-papers, bonds, banks, loans, printing papers, account book papers, drawing papers, typewriting and duplicating papers.

(ii) Blotting papers.

(iii) Wrapping papers.

(iv) Speciality papers.

(v) Boards.

Flat Papers

The term flat papers is generally applied to any papers which are stocked in the *standard or uncut sheets*, and the term includes such papers as drawing and cartridge papers, greaseproof and vegetable parchment papers. There are other papers, such as printings, art and imitation art papers, etc. Many of these are essentially for printing purposes.

13. Writings

Note-papers

These papers are writing papers cut to any of the standard sizes referred to in the chapter on Social Stationery.

They may be classified into several groups—high-class writings, wood-free writings, wood papers and esparto papers, the class of raw material employed being the basis for this classification rather than the particular methods of manufacture.

The high-class writing papers are either all rag, which may include cotton linters, or rag and chemical wood-pulp, while the wood-free writings are wholly made of chemical wood-pulp. Wood papers contain a large percentage of mechanical wood (groundwood) to which is added a small percentage of chemical wood. They are of inferior quality from the point of view of ageing and of colour, but are eminently suitable for many purposes. Esparto papers usually contain a considerable percentage of chemical wood-pulp, and are still frequently stocked.

Rag fibre, which includes linen and cotton, and cotton linters, are generally regarded as the finest materials for paper-making from the point of view of durability, always assuming that the paper-making has been properly carried out.

Linen and cotton fibres possess great felting properties, which means that where high strength, high tear and high folding endurance are required, it is possible to obtain them. However, this usually means that the paper-making process is protracted and this, coupled with the increasing rarity of good quality rags, means that this type of paper is now very expensive.

Some types of high-grade chemical wood-pulp can now be used to make paper of very high strength, comparable with the strength that can be obtained with rags.

However, most of the paper that is made with an entirely chemical wood-pulp furnish is not beaten with the intention of generating the highest strength, so that such papers are normally somewhat weaker than rag papers.

Esparto papers are very useful where a smooth level surface is required, with good flat-lying properties and good writing properties. They also are valuable for their letterpress printing qualities.

It must be remembered, as has been stated earlier, that, where large amounts of loading are put into the paper to increase the opacity or to increase the surface smoothness, then the overall strength will be lowered. A lowering of strength may also be obtained if the paper has been given special surface finishes or embossing.

Such papers may show up badly if the paper has to be folded several times in use, and care should always be taken to see that the end use of the paper is fully understood when the selection is being made.

Apart from the standard finishes which are produced in the paper-mill, a large variety of finishes can be obtained by embossing the paper, using embossing rollers. Some of these designs copy fabric surfaces such as linen or cambric and others are ribbed or corded or given special "grained" finishes.

A special finish may sometimes be given in the paper-mill by spraying water on to the web of paper before it reaches the calenders; this is known as a watered finish.

Banks and Bonds

Originally bond paper was an extremely tough hand-made paper and, later, machine-made paper, in the all-rag, tub sized, air-dried class. Now, however, the term is used to cover a wide variety of papers which may be of part rag content or all chemical wood content. It may be press sized with starch, instead of being tub sized with geletine or, indeed, it may be merely engine sized. It should, however, be manufactured so as to be eminently suitable for writing upon with ink and pen and also for typewriting purposes.

Banks, which should not be confused with bank-note paper, is a term now applied losely to any thin and tough writing paper. Roughly speaking, bonds are those papers above s/o large post 15 lb. (61 g.s.m.) in substance up to s/o large post 21 lb. (85 g.s.m.), whereas banks are those papers below 61 g.s.m.

A bank may be made with rag, be tub sized and air-dried, but the vast majority is made with good chemical wood-pulp and is press sized with starch. There are cheaper grades containing various percentages of mechanical wood, though these are also commonly sized with starch.

As with bonds, the paper must be capable of being conveniently written upon with pen and ink and also of being used as a typewriting paper. Certain types of banks and bonds are sold as being specially suitable for photocopying. These should contain no loading and preferably no optical bleaching agents, and are made so as to be as transparent as possible to the particular wavelength of ultra-violet light used in photocopying equipment.

Some banks are sold as "onion skin," which means that they have been specially air-dried after tub sizing or size pressing in such a way that a certain amount of cockle is produced. Strictly speaking, an "onion skin" should really be somewhat transparent.

Loans

Loan paper is a tub-sized paper of considerable strength made from either rags or chemical wood-pulp or both and, generally speaking, a high level of folding endurance and tear strength is aimed at. Loans are chiefly employed for bills of exchange, drafts and various other documents which have to withstand much usage, and it is an essential feature that they can be written on with ink after erasure.

Printing Papers

There are three principal methods of printing:—

(1) Letterpress

(2) Offset lithography

(3) Gravure

For letterpress work a smooth surface, which is resilient and receptive to ink, is ideal. Very many types of paper are, in fact, printed by letterpress, but two of the most suitable kinds are esparto papers or papers containing a large proportion of esparto, and art papers, which have a coating containing a large proportion of coating clay. These latter papers are expensive, but the best types take an extremely good impression in letterpress printing. They are particularly useful for the reproduction of photographs where a fine screen is used.

A cheaper paper used for letterpress printing is imitation art, where the smooth surface is obtained by filling up the sheet with as large a proportion of loading clay as it will stand. This is frequently in the region of 25 to 30 per cent. dry weight.

Book papers are in a class rather on their own, as these are required to be as bulky as possible to the detriment of other properties such as strength and folding endurance. The bulkiness is required to make the finished book as thick as possible. In the more expensive area of book production, such as technical books, great bulk is not aimed at.

At the other end of the scale are so called Bible papers, which are special papers usually containing a high proportion of rag or cotton linters and as thin as possible. This usually means that they have to have a fair proportion of loading in them to give opacity.

The paper required for offset lithographic printing can take a variety of forms and can vary from very smooth to moderately rough. Since this process involves damping the printing surface, some of which transfers to the paper, the paper must have a good bonding of the fibres in the surface layers. Furthermore, moisture must not readily upset this bonding, and the cohesion between the surface layer of fibres and those further into the sheet must be good. Otherwise fibres are liable to be removed from the surface of paper and to collect on the printing surface, giving the defect known as fluff or fuzz, or alternatively small pieces of paper may be torn from the paper surface, giving the defect known as picking.

Recent developments in the manufacture of paper have brought about the introduction of dual purpose papers which can be used equally well for both letterpress and offset lithography.

Papers for gravure printing can assume a variety of forms, but the chief requirement is a surface which is adequately receptive to the ink used. Whilst an excessive smoothness is not called for, the most important requirement is that there should not be pits and irregularities on the surface of the same order of size as the pits etched in the gravure printing cylinder. If there are, the quality of photographs reproduced on the paper will be seriously impaired.

Account Book Papers

Account book papers or ledger papers are strong, well-made writing papers, which have a high tearing strength and a high folding endurance.

There is a wide gradation of these papers from those made from all rag, using the most prolonged beating technique to get the highest possible strength, down to some cheap account book papers which could hardly be called ledger papers.

The main requirement with this type of paper is in the selection of the raw material, whether it be linen, cotton, cotton linters or special high-grade chemical wood-pulp, followed by careful specialized beating aimed at maintaining the fibre length while getting the best bonding between the fibres.

At one time these papers were hand made but now, of course, they are machine made, though usually in mills with a long tradition of handling rag papers.

In making these papers it is highly necessary that, having selected good quality raw materials, the control of the making process should be adequate so that no unnecessary quantity of alum is used in the manufacture. If the paper is left very acid, then the good keeping qualities of the original fibre will be lost.

These papers are usually carefully sized with rosin and then tub sized or press sized with gelatine, which may be hardened with the addition of formaldehyde. Some papers in this category may be size pressed with special grades of starch.

It is essential that these papers shall be able to withstand a considerable amount of erasure without the paper subsequently feathering on being written on.

Since these papers are intended to be used for a long time and to have a considerable amount of handling, they should be coloured only with dyes of good permanence.

Many account book and ledger papers are used nowadays in loose leaf form and it is important to realize that the cheapest grades, having low tearing resistance, are not really suitable for this application, as the paper can then easily get damaged at the perforations.

Drawing Papers and Cartridge Papers

These are papers made in a wide variety of substances and surfaces, and their essential requirement is the ability to take pen and ink and the ability to stand a considerable amount of erasure.

It should be noted that some cartridge papers are, in fact, intended for the offset lithographic printing process.

The highest quality rags are used for hand-made or mould-made drawing papers. Cartridge papers, originally used for cartridge making, are machine made also from cotton and linen fibres for the best grades, and chemical woodpulp for other grades.

Surfaces of drawing papers may be:—

H.P.	Hot pressed or glazed.	NOT.	Matt (Not glazed).
B.	Rough.	B.B.	Double rough.

Crayon paper, hand-made or machine-made from rag fibres, is used for crayon and water-colour work. It has either a rough surface or smooth finish and is produced in colours or tints.

Typewriting Papers

Typewriting papers are usually bank-type papers with a more or less matt surface. The surface should not be smooth or highly glazed, otherwise the typewritten character will remain too much on the surface and may give rise to smearing.

A wide variety of qualities is demanded for typewriting service, varying from quite high-grade bond papers with rag content down to cheap papers with a content of mechanical pulp. Substances vary from large post 8 lb. to large post 18 lb. (33 g.s.m. and 73 g.s.m.).

Some papers used for typewriting are loaded to make them opaque, but there is an increasing tendency for this class of paper to be made fairly transparent, particularly to ultra-violet light, so that copies can be made using the dyeline process (diazo process).

An important point to bear in mind is that there may be a clash of interests when a company requires some of its paper to have a die-stamped heading. A paper may be readily selected for its appearance, rattle and look-through which may be poor for die-stamping. In these cases it is better to ask for a range of good die-stamping papers and to make the selection from them.

Duplicating Papers

A large tonnage of paper is sold for duplicating by the *stencil process*, and the requirement here is for a fairly bulky and fairly absorbent paper which will quickly absorb the ink from the stencil so that when the next sheet is laid upon it there will be no transfer. Formerly these papers were made unsized, but, since they may also have to be written upon, in general they are sized, though not hard sized.

They should be fairly opaque, though this opacity is usually obtained partly by suitable fibre furnish and by the type of beating.

There is now a greater demand for a more opaque paper in this class, of a high white colour.

In the *spirit duplicating* process, a master copy is prepared by means of a special carbon paper, containing a high concentration of a spirit-soluble dye, with high tinctorial strength.

The master copy is prepared by making a reverse carbon copy on the back of the master paper, after which the master is attached to the cylinder of a duplicating machine.

Sheets of the copy paper are then moistened with a special duplicating fluid containing alcohol and are brought into direct contact with the master copy. Sufficient of the dyestuff is dissolved and transferred in the momentary contact to give an image.

The master papers used for this system are specially prepared coated papers containing additives in the coating to prevent bleeding of the dyestuff and to give a sharp image.

The copy papers are usually bond papers but may contain groundwood. They are usually loaded with clay or other filler and may be opacified with titanium dioxide. Surface sizing with starch is common to improve the surface characteristics. The paper does not have to be very absorbent as the alcohol penetrates rather rapidly and only a small amount of liquid is involved. Usually the surface is required to be fairly smooth, but the main characteristic is that the paper should be quite compatible with the alcoholic solvent used so that blurred copies are not obtained.

14. Blotting Papers

The principal property of a blotting paper is that it shall have an ability to absorb ink or water rapidly and shall have a high total absorptive capacity.

No size is added, of course, and normally loading materials are avoided. The best-quality blotting papers are made from high-grade rags such as old cotton and muslin.

The objective is to make as bulky a sheet as possible, and to this end the fibres are treated in beating engines fitted with sharp tackle and usually with a heavy roll. In this way the fibres are cut up rather than fibrillated.

The paper is made on a Fourdrinier machine, which may have quite a short wet end as the stock is very free-draining, and usually very little pressing is given to the sheet before it is dried. In order to maintain bulk the sheet may be dried on drying cylinders without the use of felts.

Dyestuffs may be used in the normal way to provide a coloured blotting, but in some grades coloured rags are used to give a mottled effect.

Various grades of blotting can be produced using wood-pulp either by itself or in a mixture with rags, the absorption in these cases being less than that which can be achieved with rags alone.

Some types of blotting paper are intended for virtually one-time use only, such as for interleaving diaries. It is important to see that this kind of blotting is not used in the wrong circumstances.

Blotting papers usually have a matt surface, though there are some produced with smooth surfaces, but any degree of calendering will adversely affect the absorbing power and the total absorption.

Blotting papers are sometimes encountered pasted to enamelled or coated paper, chiefly for advertising purposes.

15. Wrapping Papers

Kraft

Kraft is the most popular grade for general wrapping purposes, the best qualities being prepared from unbleached and bleached sulphate wood-pulp.

The pulp is manufactured by alkali digestion of wood chips, under pressure, either as a batch or continuous process. The development of improved bleaching techniques has made it possible to produce bleached pulps of excellent brightness and strength. Cheaper grades of krafts (usually referred to as imitation) are produced by incorporating a percentage of waste paper with the sulphate pulp, but they are not as strong as the pure kraft.

Many colours of kraft paper can be produced, from a rich golden brown (the colour of the unbleached pulp) to blues, yellows, reds, etc. and can be finished in three ways:—

(1) Glazed on one side, the other side being dull.

(2) Unglazed—dull on both sides.

(3) Ribbed, where the surface is glazed on one side.

Present-day uses of kraft paper range from paper sacks and bags to cardboard boxes and gummed sealing tape.

Two sheets of kraft laminated together with bitumen produce a waterproof paper called kraft union. It is also possible to produce kraft paper which has a high degree of wet strength, the paper retaining strength even when completely saturated.

Browns

These papers are of an inferior quality to krafts, but suffice as a cheap protective wrapper to an article. Browns are prepared from a waste paper finish, dye being added to produce the required shade, and can be "finished" in the same way as krafts, but the finish is generally poorer, owing to the nature of the materials used. The production of strong browns from hemp, jute, linen, etc. has largely died out with the advent of kraft papers.

Fine Wrappings

This type of wrapping is made lighter in weight and is generally produced from unbleached sulphite pulp. The pulp is made by acid digestion of wood chips and in the unbleached state has a whitish colour. (Different qualities can be made by incorporating selected waste material in the furnish). The pulp is given mechanical treatment which separates the fibres, which are deposited on a wire cloth to form the sheet of paper. After passing from the wire the web of paper passes round heated cylinders (varying in numbers from three to seven—5 ft. diameter) on to a large cylinder which can be up to 16 ft. in diameter and 200 in. wide, the surface of which is highly polished. The paper is pressed against the hot cylinder by a travelling felt so that the surface in contact with the cylinder receives a glazed finish and is also dried. The paper is used as confectioners' bags, drapers' wrappers, etc.

Tissues

Tissues are manufactured in numerous grades and in a variety of colours. The outstanding characteristic of such paper is its strength in comparison with its extreme thinness or lightweight nature. The quality of a tissue paper is probably more apparent to the eye than in the case of any other kind of paper, and an examination of the various grades will readily indicate the differences.

Well beaten, highly bleached hemp or rag fibre is employed for the best grades. Other grades are made from esparto. Tissues are used for the wrapping of high-quality goods, typewriting carbon paper, cigarette wrapping, air mail and Bible papers.

In recent years there has been a great growth of toilet and facial tissues and particularly of the dry crêped type. Furnishes for these grades are of bleached wood-pulp, with wet strength properties, combining softness, absorbency and strength. Often mechanical pulp is added.

While many tissues, because of their use, are made completely unsized, and others are completely free of certain chemicals, certain grades, such as toilet tissues, have to be made with a high degree of sizing—a matter of difficulty in such thin material.

Greaseproof and Glazed Transparent Papers

Greaseproof paper obtains its grease-resisting properties solely from the wet beating of the fibres from which it is made. It is usual to use a wood-pulp specially cooked to give rapid production of the "wet beating" characteristics.

This treatment yields a translucent, dense sheet which, if properly made, is resistant to the penetration of oils and greases.

The chief usage of greaseproof paper is for wrapping all kinds of fatty foodstuffs and as liners in the packing of tea, coffee, cocoa, etc. Imitation greaseproofs are made by using lower-grade fibres which have not been as wet beaten as the genuine greaseproof. This type of paper may be wet strengthened and also hard sized, but does not have the characteristic resistance to grease penetration that genuine greaseproof has.

Another type of grease-resistant paper is glazed transparent, or glassine. This is manufactured from a special body paper and the transparency is given by heavy super-calendering. To do this the paper is first wetted and then passed through a calender with a very high line pressure which is also heated. This treatment re-forms the bonds between the fibres, with the result that the paper becomes transparent. The qualities to be looked for here are good transparency coupled with freedom from pin-holes.

Vegetable Parchment

This is a grease-resistant paper which also has a very high level of wet strength. It consists of a web in which the fibres have been partly dissolved by strong sulphuric acid and reprecipitated in such a way that the whole is bonded strongly together. No other additive is used and, since the sulphuric acid is fully washed out, the product is extremely pure. It is odourless and tasteless and very highly grease-resistant and is non-porous to a great degree. Since it can also be produced with a very low level of metallic contamination, it is extremely suitable for packing certain food products and is the preferred material for packing such things as butter, margarine, cooking fat and biscuits. The absence of contaminants means that oxidation and rancidity processes are not encouraged.

The paper is made by preparing first a special unsized base paper from selected fibres and passing the web so formed through a bath of sulphuric acid at carefully controlled concentration. This penetrates the web and effects the transformation referred to above, and the subsequent processes consist of an extensive washing system aimed at getting all the sulphuric acid out of the web. This is done in a number of stages, so that a large part of the sulphuric acid can be recovered, concentrated up and used again.

Several other special uses have been found for this paper—*e.g.*, special packaging, use in telegraph tape machines, as a machinery component in the spinning industry, as an interleaving medium in the rubber industry and in the manufacture of lamp shades. It has also found a number of electrical uses, since it can be produced with a very high electrical resistance.

Waxed Papers

Waxed papers are produced for wrapping purposes where it is necessary for the material to resist penetration by water, or to act as a barrier in a package, particularly to water vapour. In certain uses, they are also used for appearance purposes. There are two principal types of waxing.

"Dry waxed" paper consists of a base paper which is impregnated by passing it through two rollers, one of which is partly immersed in a bath of molten wax. Only one side of the paper receives the wax. It is then passed over a heated metal cylinder in contact with the unwaxed side. In this way, the wax penetrates the paper and the surface is left more or less free of wax. The resultant paper has a good degree of water resistance. However, water vapour can penetrate the structure to some extent.

The other type is produced by the so-called "wet wax" technique, which leaves a continuous film of wax on the surface. Base paper is passed through a bath of molten wax and, after excess wax is removed by rollers, the web is cooled in a cold water bath. Provided a suitable wax is used, the structure then has good barrier properties to water vapour.

The earlier waxed papers were produced with paraffin wax and this is still used today, especially for the cheaper grades. However, improved barrier properties can be obtained by upgrading the wax with additions of microcrystalline wax and various polymers such as ethylene vinyl acetate. Other important properties required are suitability for heat-sealing, use on wrapping machines, pliability, flexibility, scuff resistance and gloss. In many packaging applications, the waxed paper must heat seal swiftly and reliably to give a good overall barrier.

Base papers range through glazed tissues, glazed imitation parchments, glassines and krafts. It is important to note that the base paper strength properties are in general unaltered by waxing. Therefore, if strength is required, a strong base paper must be used. Where appearance is of little importance, unbleached base paper may be used, otherwise it is necessary to use white or light coloured papers. For maximum transparency a glassine type base paper is required and this will also allow a good surface film of wax to be achieved. In certain special cases, such as "twisting wrap" for confectionery, a great deal of care has to be given to the manufacture of the base paper in order to meet the requirements.

Waxed papers may also be made by a laminating technique and this produces the advantage of combining a good moisture vapour barrier in the centre of the "sandwich" with a dry waxed, or even an unwaxed, outer surface.

Many packaging applications require the paper to be printed, so that the paper, therefore, has to be made suitable for printing (usually by the flexographic process) as well as suitable for waxing. Dry waxed papers can be printed on after waxing, but wet waxed papers are printed before waxing.

Products requiring waxed paper for wrapping include foodstuffs, confectionery, machine parts and accessories, etc. It is also used for carton lining and packaging, etc.

Corrugated Paper

Corrugated paper consists of sheets of paper, one of which is formed into regular undulations known as "flutes." There are two main forms, "Single faced" and "Double faced." The former has a flat sheet bonded to the peaks of the flutes on one face, whereas the latter form has a flat sheet bonded to each face of the corrugated sheet. Each of the plies can be of similar paper and substance, or they may be different. Consequently there are many variations, but not all are produced by any one manufacturer.

In producing single faced corrugated, the web to be formed into flutes passes between two intermeshing, steam heated, metal rollers, which are grooved at right angles to the direction of travel, in the wave pattern of the flutes required. Stationary metal guides hold the formed flutes in position as the paper passes around one roller and adhesive is applied to the peaks of the flutes on one face by another roller which is partly immersed in the adhesive trough. Simultaneously the lining paper is passing around a steam pre-heating cylinder, after which it is brought into contact with the corrugated to pass a nip roller. This applies pressure to ensure satisfactory bonding.

To produce double faced corrugated, adhesive is applied to the fluting on both faces, and liners are adhered to each. The formed sheet then passes through a drying area before reeling and cutting.

Specially formulated starches and sodium silicate are both used as adhesives. The type, grade, ultimate use of the corrugated paper and equipment available, will govern the adhesive used.

The flute formation in both height and frequency can vary and the accepted standards are usually classified as follows:—

Type	Approx. peak height	Flute frequency per foot
A	$\frac{3}{16}$ in.	36
B	$\frac{1}{8}$ in.	51
C	$\frac{3}{32}$ in.	42
E	$\frac{1}{20}$ in.	96

Base papers used to make corrugated paper include krafts produced from both bleached and unbleached sulphate pulps, which may be glazed M.G. or machine finished papers, and can vary in substance from lightweight to heavyweight. Bleached or coloured glassines, greaseproof, glazed imitation parchment and mechanical base papers, are all regularly used for lighter weight, single and double faced papers. A common industrial single faced corrugated used for general wrapping purposes, is produced from straw paper, consisting mainly of repulped waste material.

Corrugated is used where a bulky, relatively rigid material is required for protective wrapping and cushioning. It is extensively used in the furniture and textile trades, and in many others for a variety of packaging purposes.

The heavier krafts are usually double faced or even multi-wall (*i.e.*, where more than one fluting layer and additional separating or facing papers are used) and are used for making packaging cases and shipping containers.

The lighter weight grease resistant papers, usually in single face form, are mainly used as separators in biscuit and chocolate boxes. Double faced corrugated, particularly with greaseproof paper facings, is cut into shapes to be formed into biscuit boxes, etc., and also used to pack a variety of shapes and sizes into a single unit, when the irregular form of the product would make direct wrapping impossible.

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Facings can be printed if required. They may also be laminated to other materials, such as aluminium foil, or specially treated to be made water resistant.

The resistance to crushing is measured on a special instrument known as a crush tester. Very heavy materials are subjected to compression and puncture resistance tests.

A recent development has been the production of corrugated for display purposes. Available in a range of flutings and colours, it is an effective and decorative material.

16. Speciality Papers

Carbon Papers

Carbon papers consist of a thin base paper coated on one side with a dark coloured coating which will transfer under pressure to the surface of another paper. The principal types are pencil, typewriting, and one-time carbon. They all work on the same principle, but differ in the composition of the coating. The base paper should have a smooth surface, a uniformly high density and a good formation, and it should be free from pin-holes. Pencil and typewriter carbons have more coating on since they have to be capable of being used many times over, whereas onc-time carbon is much thinner.

Basically, the coating consists of carbon black or sometimes another pigment, plus toners, lake pigments or oil soluble dyes and a wax, either natural or synthetic, which acts as a binder.

In modern carbon papers the coating is treated in such a way that it is non-smearing and does not readily rub off.

Carbon papers are produced in a number of grades and several colours.

Spot carbonising is an application wherein the back of a business form is coated with carbon only in those spots where it is required to transfer information. This process requires that the base paper shall be especially free from pin-holes.

Carbonless Paper

This paper, introduced a few years ago to this country, was developed in the U.S.A. The process depends upon the coating of one side of a piece of paper with a coating containing a dyestuff enclosed in minute capsules. The top side of the next piece of paper is coated with a special coating containing a mineral with an activated surface. When the two papers are pressed together, as when a pencil or typewriter is used, then the minute capsules burst, the dyestuff they contain is rapidly oxidized to a coloured material by the activated mineral surface and the result is a transferred image without the use of a carbon paper.

In commercial practice the coating containing the encapsulated dye is known as the CB coating, while the coating containing the active mineral constituent is known as the CF coating. Three types of paper are therefore possible—CB coated only on the back, CFB coated on the front and back, and CF coated only on the front. Multi-part sets can be made up, therefore, consisting of a CB sheet at the top, one or more CFB sheets in the middle and a CF sheet at the bottom.

Up to eight copies can be conveniently taken and more if the papers are thin enough.

In handling these papers it is essential to make sure that they are stored and used the right way round. Also, unnecessary pressure or blows should be kept from any paper carrying a CB coating as this will prematurely burst the capsules.

This process is very convenient to use and is particularly clean when large numbers of sheets have to be handled.

Tracing Papers

Tracing papers, as the name indicates, were used originally for the purpose of tracing from original drawings so that a translucent copy was available for reproduction by such as the diazo process. Today, however, they are most used for drawing on directly in the production of original drafting work.

They may be divided into three types.

(1) Natural tracing papers, which are made transparent by virtue of the fact that the fibres are given a very high level of beating, with the result that the finished sheet is quite transparent. This type of paper is difficult to make, but has the great virtue that it can be produced with very good erasing qualities and good resistance to ageing.

(2) Prepared tracing papers, which are made transparent by impregnating a base paper with oils or resins. There is a wide variety of possibilities here, but care has to be taken that the type of oil or resin used for impregnation does not unduly yellow the paper on ageing or make it brittle.

(3) Detail papers. These are papers which are not made excessively transparent by beating during manufacture, but care is taken to see that they have no loading and are as transparent as possible to ultra-violet light. These are used in cases where a drawing is made directly on them, with the intention of making a photocopy afterwards by the diazo process.

Photocopying Papers

Papers used for all photocopying processes are specially formulated and require in most cases chemical compound, or emulsion coatings, that are sensitive to radiation by light or heat. The processes are dealt with in a separate chapter. This section is only concerned with the material. Similarly, of the materials that can be used, the only concern here is paper. However, the subject is very wide and complex and only brief comments can be made.

Papers for use with photocopying processes may be classified under four headings.

Photographic Processes: These processes or derivatives of them, depend on materials containing light sensitive silver salts. Film or paper can be used but only the latter is the concern of this chapter. The processes require a paper made to closely controlled standards. Colour—usually white—purity and freedom from contaminants are essential features. The surface is controlled with regard to smoothness, or it may have a specially patterned grainy surface. In addition, sizing, wet strength, and acidity all have to be maintained at specific regular values.

Photographic papers required for fine detail reproduction work, often require to be coated with pigments—usually barium sulphate with gelatine as a binder—and calendered to effect the necessary gloss. Such papers are referred to as "Baryta Coated" papers.

For reproduction of line drawings and documents, the papers are usually thinner and uncoated, and some kinds have specified opacity to make them suitable for reflex copying.

The diffusion transfer process requires a negative paper which is essentially a normal photographic paper of the document copying type, coated with a silver-containing emulsion. Positive paper is a somewhat different special type of paper, but pure enough not to interfere with the layer of "nucleating centres" with which it is coated. It must be sized and wet strengthened sufficiently to withstand the action of peeling apart from the negative after development.

Papers used for the gelatine transfer process are substantially different to those used for other silver halide processes. The matrix or negative paper, is specially made not to contain any substance which will cause premature hardening of the gelatine layer. It may be coated with a plastic layer to give improved operation.

The positive paper must have sufficient strength and freedom from curling. It can also be treated during manufacture, with chemicals to improve the image density and definition.

Diazo Processes: For these processes the paper is coated with diazonium compounds which form the sensitizing layer. As they are applied in an aqueous solution without any gelatinous substance, the uniformity of the coating depends in large measure on the uniformity of penetration into the paper. Hence, the paper must be made with a uniform penetration quality to aqueous liquids, but must be sufficiently sized to prevent the sensitizer penetrating too deeply. If this occurs, deeply embedded diazo salts will not be fully bleached by the action of light and uneven reproduction will result.

Certain types of diazo process require a particular sizing agent, as normal rosin size may react with the sensitizer to give unwanted colour.

The paper must be free from some kinds of contamination and attention must be paid to physical strength characteristics to withstand the considerable handling it may receive during its life.

The original is required to be on a translucent paper. Special bond papers have now been formulated with a fine grain, which are translucent enough to allow sufficient light penetration. Many business forms are today printed on this special bond to facilitate their reproduction.

Heat Processes: As the name implies, these processes require a base paper with a coating that is sensitive to heat. There are several methods employed, but generally for direct copying it is necessary to use a semi-translucent paper which is not absorbent to the coating mixture. It must also be made in such a way that it is sufficiently resistant to the application of heat.

Electrostatic Processes: In the so-called indirect electrostatic process the image is first formed on a selenium surface and then treated with powder, which is transferred on to the final copy paper. At first it appeared that any paper could be used to receive the final image; in practice it is found that there is a distinct advantage in using a paper specially made for the purpose, since some types of paper are found to cause deterioration in the copying apparatus after a number of copies have been produced.

With the so called direct process, the electro-sensitive layer is on the paper itself. Therefore, the paper must be made so as to accept the type of coating involved, which includes prepared zinc oxide, binders and often sensitizing dyes. This generally means that the paper must not allow too much penetration of the coating and must not contain materials that will interfere with the sensitizing layer. Some compositions are based on organic solvents, and papers for this type must be strongly resistant to oil and solvent penetration.

Crêpe Paper

Crêping is normally carried out by two methods. In the first, the crêping is carried out on the paper machine while the web is still moist and the web is then subsequently dried. In the second method, the paper is dried on the cylinder and is removed from the cylinder by means of a crêping doctor.

The second method has a greater effect upon the sheet structure, which is considerably disrupted, and the final effect is one of much greater softness.

In some cases, the crêpe is required in paper to give a greater degree of stretch, whilst in other cases, such as toilet and sanitary tissue, the primary object is to give enhanced softness.

Where softness is required, this may be increased still further by the addition of softening agents to the paper which either act by attracting moisture to the sheet (humectants) or have the effect of reducing fibre-to-fibre bond strength. Some of the softeners used are urea, invert sugar, oil, wax emulsions, glycerine, di-glycol stearate, sulphonated oil, etc.

Special types of crêpe paper are required for such uses as masking tape.

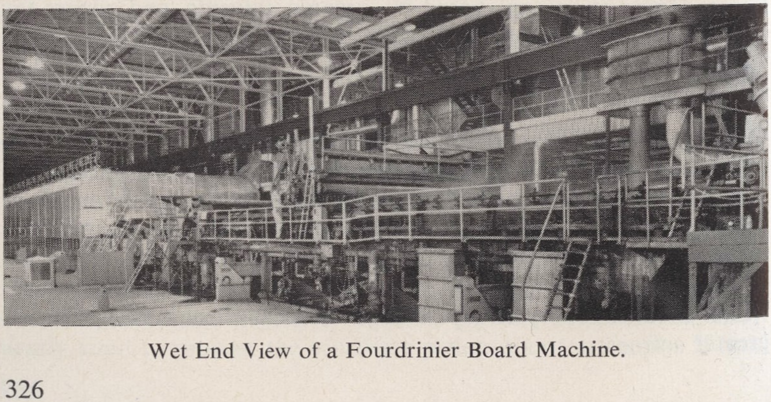
A new process was introduced a few years ago which, in effect, gives a micro-crêping in both directions. Such papers have a high level of stretch in both machine and cross direction. They have been used for special packaging purposes and for special bags.

17. Boards

Boards are defined as such by British paper trade custom when the substance is more than 90 lb. per 480 sheets of double crown (20 in. × 30 in.) equivalent to 220 g./m^2. Types of board usually meeting this requirement include cardboard, millboard, boxboard, stiffeners, etc.

From this definition it should be noted that reference to the type of machine on which the board is made, for purposes of definition, is not strictly correct; thick paper of the above substance can be made on the Fourdrinier and the vat or cylinder mould machine often used for making boards are also used to make paper. As with paper, certain types of board can be coated to improve the finish, or to give it a good printing surface.

The cylinder-mould and vat machine previously referred to, is the most common method of making board in a continuous process. Raw materials used are similar to those used for paper, but waste



Wet End View of a Fourdrinier Board Machine.

papers form a large percentage of the board furnish. Many boards are made with layers of different fibrous content, according to the purpose for which it is required. A strong carton might have a sulphite liner inside, a kraft liner on the outside, and a waste paper middle layer.

Certain boards, notably millboards, are made on an intermittent machine. The continuous layer of pulp from the Fourdrinier or cylinder-mould machine, is built up into the required thickness by reeling on to a "making roll" and subsequently dividing into sheets, by cutting it along the length of the roll.

Pasteboards are made by pasting together several layers of finished paper.

It is convenient to mention at this point that terms such as "multi-ply," "triplex" and "duplex," are often interpreted very differently by different manufacturers and users. Preferred terms are "multi-layer," "three-layer" and "two-layer" boards.

There is a considerable variety of boards made for many purposes. The following are the most commonly used.

Pulp Boards

These are made on the Fourdrinier or cylinder machine in exactly the same manner as described for paper, but with the difference that the speed of the machine is considerably less. This is due to the greater amount of pulp necessary to produce the thicker sheet, or web, and the extra time needed to drain off the larger volume of water.

Pulp boards are of varying qualities, but in every case they are composed of one layer only; the whole substance of the board is the same, as distinct from the different "middle" of the pasteboard. They can be made from particular pulps or a mixture of pulps.

Pasteboards

These are made by pasting two or more papers together. In the case of 3-layer (and additional layers) lower quality papers are used as the middles, with better class papers for the outsides.

Small quantities are still made by hand pasting, in which case the finish is invariably applied by glazing between zinc plates.

Machine-made boards are produced in continuous webs on pasting machines. After pasting, the layers are brought together between rollers and then passed over a series of heated cylinders which gradually dry out the moisture.

Before being rolled at the other end of the machine, webs are sometimes passed through calender rolls to give the boards a better surface. If a really high finish is required, then the boards are passed through a set of super-calender rolls, but this is usually carried out as an entirely separate operation.

The thickness of pasteboards is indicated by the term 3-sheet, 4-sheet, etc.; but it should be understood that these terms apply only to the thickness of the board and not to the number of sheets used in its make-up.

Three-layer (Triplex) Boards

These are pulp boards made by the triplex principle on a cylinder machine combining three layers—two outside, which may be either white or tinted, and a middle of special or inferior quality.

They are brought together in the moist state, rolled, dried, and finished in the web. This method of manufacture provides the special characteristics of strength, rigidity, and excellent folding.

Two-layer (Duplex) Boards

These boards are manufactured by coating, pasting or felting two or more layers together so as to provide different colours on each side.

Index Boards

These are strong, durable boards, now largely used as guide cards in card-index systems. The genuine board should be made from manila hemp, but bleached and unbleached wood-pulp is also largely used, and it produces a tough material suitable for a great many of the purposes for which manila boards (made from the genuine fibre) are employed.

Although these boards are generally buff, coloured manila boards are produced, but a white board sold as a manila cannot contain the genuine fibre, because manila is very difficult to bleach. This fact accounts for the predominance of the buff, a more or less natural colour.

Ivory Boards

These are high-grade boards of two or more laminations of identical quality pasted together, possessing a characteristic translucency and rigidity.

The better qualities are produced from best grade rags and others from well prepared wood-pulps.

They are available in matt (rough) or smooth finishes, and in a multiplicity of substances, termed thin, thick, medium, extra thick, etc.

Ivory boards are ideal for high-class productions of invitation, menu, masonic, correspondence, visiting and business cards.

Bristol Boards

These are very fine quality boards made from all-rag, tub sized papers. Two or more sheets are pasted together, and the high finish is obtained by plate glazing. The best qualities are hand pasted, and much care is expended in their manufacture. Other boards which are sold as Bristol boards are composed of cartridge paper middles and drawing paper outsides. In either case the substance or thickness is governed by the number of sheets, the thickness ranging from 2-sheet to 6-sheet. Bristol boards are used for card-index systems where a stout card with a good writing surface is essential: certain grades are used by artists.

Strawboard

This is mainly produced in Holland and is a low-priced type of board made from cereal straw. The types of straw mostly used are wheat, rye, barley and oats.

The straw-pulp is prepared by cooking chopped straw with caustic lime under pressure in a digester for several hours. After refining and cleaning, the stuff is ready for the board machine. Strawboard is made on Fourdrinier board machines. It can be supplied in sheets and on reels, either unlined or with a lining suitable for printing. The substances for one-layer sheets range from about 4 oz. (250 g.s.m.) to about 20 oz. (1,200 g.s.m.). Heavier weights are obtained by pasting two or more layers together and range from 1½ lb. (1,400 g.s.m.) to 4 lb. (3,800 g.s.m.).

Strawboard is used in the box-making industry, for bookbinding, letter file manufacture, tube-making, etc.

Chipboard

This term refers to board made from recovered waste paper on a vat machine.

Chipboards are used in the manufacture of cardboard boxes and containers and are sometimes lined with other papers by lamination. They are also used for manufacturing tubes, in bookbinding, and for showcards, stationery, etc.

Lined chipboards have a white or coloured liner, made from pulp, which is suitable for printing. The main use here is in carton manufacture. The entire board is produced in one operation on a vat machine.

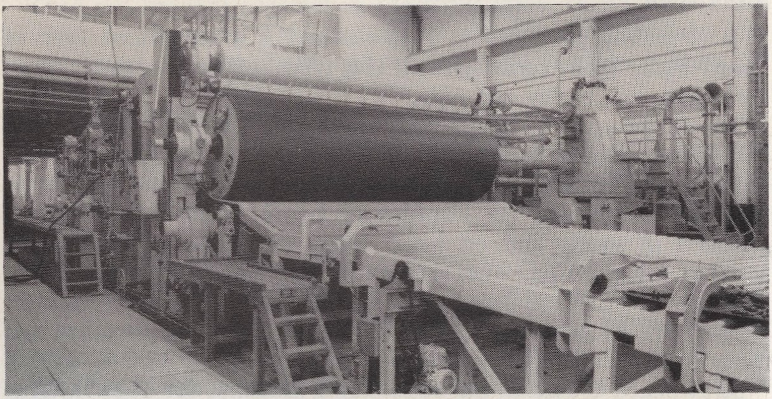
Chipboards can be made from 0·014 in. to 0·045 in. in thickness on the multi-vat machine, and up to 0·250 in. by laminating several layers together, in a later operation.

Millboard and Fibreboard

These comprise a large class of boards consisting basically of vegetable fibres from second-hand waste materials, suitable cleaned and made on the intermittent board machine.

The intermittent machine has only one vat and the thickness and weight of the finished board depends on the number of layers built up on the making roll. When the required number of layers have been accumulated (containing about 60 per cent. moisture), the board is cut off automatically, or by hand. Following this operation, the boards are pressed to bring the moisture content to approximately 50 per cent. before final drying and calendaring, etc.

A Fourdrinier machine can be used instead of the vat, but the layers are thinner, and consequently more would be needed to build up into the required thickness.



Intermittent Board Machine.

The degree of stock preparation and choice of furnish, depends on the required final strength of the board. A considerable quantity of millboard is used in the boot and shoe industry for insoles, stiffeners, heel lifts and reinforcement of footwear. Consequently the quality and strength of the board when wet is particularly important to boot and shoe manufacturers. It has to be examined after immersion in water for a period of hours, in addition to tests when dry.

Another well known use for millboard is for radio and television back plates. For this use numerous ventilation holes are required in the board. A coat of cellulose lacquer is usually given to improve appearance.

A fair amount of board of a slightly better quality than the previous example is that used for fibreboard "suit cases." The better the case the better the board, and beating and furnish must be such to obviate delamination and to allow creasing to shape the case. Obviously a longer fibre board is required than that for radio back plates.

Bookbinding also uses a fair amount of millboard, and here the furnish is not critical and only enough beating to resolve the fibres is necessary. Too much beating makes the board more susceptible to atmospheric changes which are undesirable in bookbinding.

Other uses of millboard are too numerous to mention when one considers the various shapes and sizes that are cut out of a piece of millboard, even ignoring the numerous discs and washers that one sees daily to say nothing of chair seats and backs, pipe joints, cutting boards for guillotines, etc.

A market exists for millboard incorporating bitumen. This bitumen is added as an emulsion at the beater stage and confers on the board better dimensional stability and water repellency as well as rendering the board thermoplastic. The fibre furnish is not critical providing it is not too short, otherwise it would be brittle and would not bend. It has to be up to a given tensile strength, etc., but it is essential to resolve the fibres so as to allow intimate mixing of the bitumen emulsion for the subsequent cracking and hence even distribution. However, with the advent of plastics, synthetic rubber can be used for thermoplastic board, this leading to an expanding field for the incorporation of synthetics as well as natural latex for the manufacture of speciality boards.

Caliper range of millboard is approximately 0·030 in. to 0·375 in. and weight from 3·0 oz. to 35 oz. per square foot.

Leatherpulp Board

If natural latex is used as a binder, it is usually manufactured on an intermittent machine using a Fourdrinier wire at the wet end instead of the single cylinder vat,

A mixed waste vegetable fibre is used and to this wet or dry ground scrap leather is added, the percentage depending on the quality of the board. The 100 per cent. leather fibre board bound with latex is the dearest, and that bound with natural latex usually tends to flex better than synthetic bonded material.

Special Boards

Many boards are made for speciality use. Among those not previously mentioned are hardboard, plasterboard and building board, used in the building industry for lining, panelling, insulation and many other purposes.

18. Substance and Equivalent Weights

Substance

The substance (often *incorrectly* described as thickness) of paper is defined as the weight of paper contained in a given area. The traditional method is to quote the number of pounds weight in a ream of sheets of the size quoted. The ream, which formerly was either 480, 500 or 516 sheets, is now defined as 500 sheets.

This method of quoting substances has the disadvantage that the sheet size has to be quoted alongside the weight. To overcome this it has become in recent years more common to quote substance as "grams per square metre", the international shorthand for which is g./m.^{2} This method allows the use of a single figure to define the substance of the paper.

Substance is commonly measured by cutting out a piece of paper with a standard template and weighing it on a specially calibrated direct-reading balance. Where accurate results are required, as for instance where a dispute exists, the paper must be conditioned in a controlled atmosphere before weighing. British standards have been published covering in detail the methods for the conditioning of paper and board and the methods for the determination of paper substance.

Preferred Basis Weights (Substances)

The range of paper and board in both size and weight is extremely wide and, to the inexperienced, bewildering. In order to reduce this range to more reasonable proportions, and to the advantage of all concerned, standards have been published covering sizes, packaging, labelling and substance. The first three items will be dealt with in succeeding sections, but it is convenient at this point to deal with substance.

The International Organization for Standardization, of which the British Standards Institution is a member, has issued a recommendation on basis weights (substances). This details a preferred series of basis weights for paper and board, as follows:—

g./m.^{2}	g./m.^{2}	g./m.^{2}	g./m.^{2}
100	180	315	560
112	200	355	630
125	224	400	710
140	250	450	800
160	280	500	900
			1,000

The series may be extended in either direction by adding or deleting noughts, or by adding decimal points as required.

It is recognized that this range is not consistent with current U.K. practice, but it is felt that a reduction in the number of basis weights in both paper and board which papermakers and paper merchants have to stock would be advantageous, and it is hoped that the publication of this series will facilitate a gradual move towards that end. Attention is drawn to the fact that the fulfilment of this objective will no doubt depend more on the user than on the papermaker.

Equivalent Weights

Pounds per Ream: It is often necessary to order a paper, of one substance and size, in the same substance but a different size. For example, substance size of Royal (20 in. × 25 in.) 30 lb. may be needed in size Double Crown (20 in. × 30 in.), but of the same substance as Royal 30 lb. It is, therefore, necessary to ascertain the "equivalent weight" in the Double Crown size. This is done by a simple arithmetical calculation in which the "weight per square inch" is found, and this is then worked out for whatever size is needed. Thus, using the example quoted, the weight per square inch of Royal 30 lb. is $\frac{30}{20 \times 25}$.

To find the equivalent weight for Double Crown the above sum is multiplied by the number of square inches in Double Crown—*i.e.*, 20 × 30—producing the sum $\frac{30 \times 20 \times 30}{20 \times 25}$. This works out to 36, meaning that a paper with a substance of 30 lb. Royal will be 36 lb. Double Crown in equivalent weight.

This calculation can be set out in the following easily memorized formula:—

$$\frac{\text{Known weight (in lb.)}}{\text{Known size (in sq. in.)}} \times \frac{\text{Unknown size (in sq. in.)}}{\text{—}}$$

Grammes per Square Metre: With this method the calculation of equivalent weights becomes superfluous, as the weight expressed in g./m.^{2} becomes a standard for the paper at all times and is independent of the size in which it is ordered. Thus a substance of 61 g./m.^{2} (this is the equivalent of 16½ × 21, 15 lb.) is designated as such irrespective of the size of paper required.

Methods of Conversion: Multiplication factors for converting weight in lb./ream (500) to g./m.^{2} or for converting g./m.^{2} to lb./ream (500) have been detailed in the list of traditional British sizes. To avoid possible confusion, metric conversions of dimensions have not been included.

An example of the use of these factors can be given using Large Post 16½ × 21 S/O/15 lb. For converting to g./m.^{2} the multiplication factor is 4·06 and for converting to lb./ream 0·246, *i.e.*,

$$\begin{array}{l} \quad 15\text{ lb.} \\ \times\ 4{\cdot}06 \\ \hline 60{\cdot}90 \text{ or } 61\text{ g./m.}^2 \end{array} \qquad \begin{array}{l} \quad 61\text{ g./m.}^2 \\ \times\ 0{\cdot}246 \\ \hline 15{\cdot}006 \text{ or } 15\text{ lb.} \end{array}$$

Detailed conversion factors and tables, including metric conversions, are published as a British Standard.

19. British Standard Sizes

A British Standard "Sizes of paper (writing and printings, wrappings and casings, and trimmed boards)," was originally issued in 1937 at the request of the Standards Association of

Australia and covered sizes of papers manufactured in the United Kingdom and other countries of the Commonwealth. The standard was revised in 1951, when sizes of wrappings and casings were omitted, and again in 1960, when the range of sizes was reduced. All of these editions dealt only with the sizes supplied by the papermaker or paper merchant.

Meanwhile, the International Organisation for Standardization (ISO) was studying the standardization of trimmed sizes of sheets of paper in the form of stationery, printed matter and certain other products. The international discussions brought to light a fundamental difference of practice in regard to the whole basis of arriving at standard sizes of paper. British practice was to use the untrimmed size as the basis, from which the trimmed sizes were obtained by removing a variable amount of "trim." In many countries the trimmed size was fixed regardless of the untrimmed size from which it was obtained.

In order to avoid confusion, the following definitions were used:—

Untrimmed size:	Dimensions of a sheet of paper or board, untrimmed and not specially squared, sufficiently large to allow a trimmed size to be obtained from it, as required.
Trimmed size:	Dimensions of a sheet of paper or board trimmed ready for use by the ultimate user.

These definitions are acceptable to printers and other users in the United Kingdom, but it should be noted that papermakers may interpret "untrimmed" and "trimmed" as meaning "not guillotine trimmed" and "guillotine trimmed" respectively. In order to avoid this possible confusion the words "stock sizes" were introduced; this implies that the paper or board may be guillotine trimmed or not but, that it will normally require further trimming by the printer before it is ready for use by the ultimate user.

The ISO Recommendation covers two ranges of trimmed sizes based on a logical system in use in nearly 30 countries. Its principal advantage is, that every size in the main and subsidiary ranges has the same proportions, which facilitates enlargement or reduction of printed matter, diagrams and similar material by photographic means. The sizes are based on metric dimensions. Details of these sizes were published in 1959 as a separate standard.

Now that it has been decided that the United Kingdom will in due course adopt the metric system, it is felt that it is appropriate to combine both standards into a single publication, and this British Standard has been prepared under the authority of the Paper Industry Standards Committee. In it, the ISO trimmed sizes are used as the basis; their use is recommended in place of the traditional British sizes. Provision is made for the untrimmed sizes meanwhile standardized by ISO from which the trimmed sizes in the principal series can be produced. It is recognized that there will necessarily be a period of transition and, to facilitate this, details of the traditional British untrimmed sizes have been included; it is intended to delete them when this standard is next revised.

Scope

The first part of this British Standard specifies trimmed sizes of papers intended for administrative, commercial and technical uses, and printed matter such as forms, professional periodicals and catalogues. It does not necessarily apply to newspapers, published books, posters, continuous stationery or other specialized items.

The second part lists the sizes of machine-made writing and printing papers and boards normally held in stock by mills and merchants from which the final trimmed sizes can be obtained.

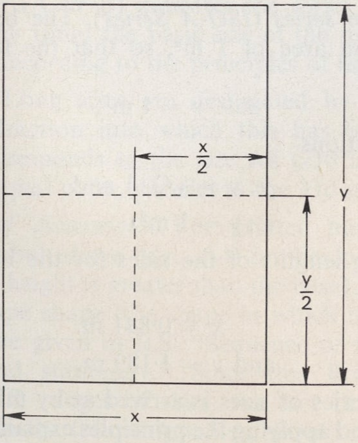
Lastly, it specifies details of packaging and labelling.

Included are details of traditional British sizes of untrimmed writing and printing papers, offset cartridges, ledger and cover papers, index boards, pulp boards, paste boards, duplex, triplex and ivory boards and drawing cartridges but, these will not be required when the metric system alone is used in the United Kingdom.

Principle (Trimmed Sizes)

(*a*) *Basis*. Each of the two series specified, consists of a range of sizes formed in such a manner that:—

(1) Each size is achieved by dividing the size immediately above it into two equal parts, the division being parallel to the shorter side. Consequently the areas of two successive sizes are in the ratio 2:1 (see Fig. i).

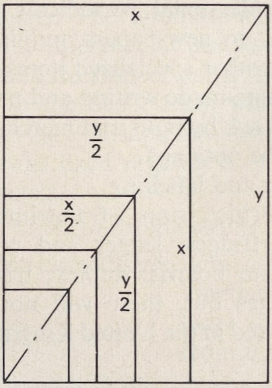


(i) The Halving Principle.

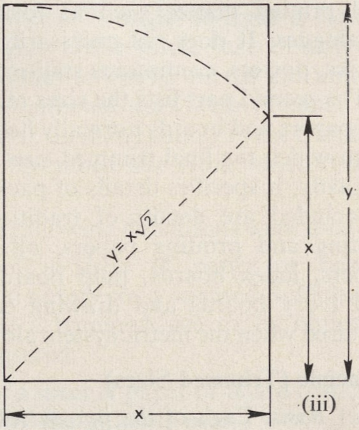
(2) All the sizes in each series are geometrically similar to one another (see Fig. ii). This requirement, combined with that explained in the preceding paragraph, gives the following equation for the sides x and y of a given size:

$$y:x = \sqrt{2}:1 = 1{\cdot}414:1 \text{ (see Fig. iii)}$$

In other words, the ratio between the sides x and y, is thus equal to the ratio between the side and the diagonal of a square.



(ii)



(iii)

(ii) An illustration of the geometrical similarity of sizes.

(iii) An illustration that the ratio between the sides equals that of the ratio between the side and the diagonal of a square.

(*b*) *System of measurement*. The sizes are based on the metric system of measurement.

(*c*) *The principal series* (*ISO-A Series*). The basic size of the A series (AO) has an area of 1 m², so that the following equation applies:

$$x \times y = 1 \text{ m}^2.$$

therefore the equations

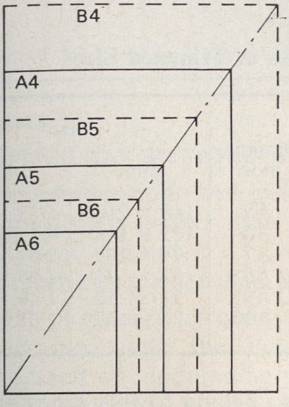
$$y:x = \sqrt{2}:1 \text{ and}$$
$$x:y = 1 \text{ m}^2.$$

give the following lengths of the sides for the basic size of the A series:

$$x = 0{\cdot}841 \text{ m.}$$
$$\text{and } y = 1{\cdot}189 \text{ m.}$$

The principal series of sizes is arrived at by taking the basic size described above and applying the principles explained under "Basis". This series is known as the "ISO—A series."

(*d*) *The subsidiary series* (*ISO—B series*). A subsidiary series of sizes is obtained by placing the geometrical mean between adjacent sizes of the A series in sequence so that the same proportions are retained (see Fig. iv); this series is known as the "ISO—B series."



(iv)
Relationship of Supplementary B Series to A Series.

(*e*) *Long sizes.* Long sizes are obtained by dividing any appropriate sizes from the two series previously mentioned (but see Trimmed sizes (C)) into three, four or eight equal parts, parallel with the shorter side, in such a manner that the ratio between the longer and the shorter sides is greater than $\sqrt{2}:1$.

Designation of Sizes

(*a*) *Principal and subsidiary series.* Each trimmed size in the principal and subsidiary series is designated by a letter followed by a number. The letter (A or B) indicates the series, and the number indicates how many times the basic size of the series (known as 0) has been divided (according to the principles of (*a*) Basis).

(*b*) *Long sizes.* Long sizes are designated by the original size preceded by the fraction into which this has been divided. For example, A4 $\frac{1}{4}$ corresponds to the size A4 (210 mm. × 297 mm.), divided into four equal parts, parallel to the 210 mm. side.

(*c*) *Expression of dimensions.* For printed matter and printed stationery, the symbol above (*e.g.*, A4) implies portrait shape (the shape in which the height is greater than the base); the symbols used to indicate landscape shape (the shape in which the base is greater than the height) are given in B.S. "Sequence of measurements for printed matter and stationery." Since this British Standard is concerned only with ranges of sizes, the fact that only the basic symbols are used in the following tables, should not be interpreted as precluding the use of landscape shape documents or publications.

Trimmed Sizes

(*a*) *Principal series* (*ISO—A series*). The sizes of the ISO—A series are intended primarily for all kinds of stationery and for certain classes of printed matter as detailed under Principle (Trimmed Sizes). The sizes shall be in accordance with Table 1.

Table 1. "ISO—A" Series of Trimmed Sizes

Designation	Size		Designation	Size	
	mm.	in.		mm.	in.
A0	841 × 1189	33·11 × 46·81	A5	148 × 210	5·83 × 8·27
A1	594 × 841	23·39 × 33·11	A6	105 × 148	4·13 × 5·83
A2	420 × 594	16·54 × 23·39	A7	74 × 105	2·91 × 4·13
A3	297 × 420	11·69 × 16·54	A8	52 × 74	2·05 × 2·91
A4	210 × 297	8·27 × 11·69	A9	37 × 52	1·46 × 2·05
			A10	26 × 37	1·02 × 1·46

Note: The rarely used sizes that also belong to this series are:

4A0: 1682 mm. × 2378 mm. 66·22 in. × 93·62 in.
2A0: 1189 mm. × 1682 mm. 46·81 in. × 66·22 in.

(*b*) *Subsidiary series* (*ISO—B series*). The sizes of the ISO—B series are intended for use only in exceptional circumstances, when sizes are needed intermediate between any two adjacent sizes of the A series; when such circumstances arise, they may be used for the same purposes as those mentioned for the A series.

The sizes shall be in accordance with Table 2.

Table 2. "ISO—B" Series of Trimmed Sizes

Designation	Size		Designation	Size	
	mm.	in.		mm.	in.
B0	1000 × 1414	39·37 × 55·67	B5	176 × 250	6·93 × 9·84
B1	707 × 1000	27·83 × 39·37	B6	125 × 176	4·92 × 6·93
B2	500 × 707	19·68 × 27·83	B7	88 × 125	3·46 × 4·92
B3	353 × 500	13·90 × 19·68	B8	62 × 88	2·44 × 3·46
B4	250 × 353	9·84 × 13·90	B9	44 × 62	1·73 × 2·44
			B10	31 × 44	1·22 × 1·73

(*c*) *ISO long sizes.* So far as possible, long sizes should be produced from the A series.

They are intended for use for labels, tickets and similar products.

The following are examples of long sizes:

Designation	Size	
	mm.	in.
$\frac{1}{3}$ A4	99 × 210	3·90 × 8·27
$\frac{1}{4}$ A4	74 × 210	2·91 × 8·27
$\frac{1}{8}$ A7	13 × 74	0·51 × 2·91

Tolerances

The trimmed sizes are subject to the following tolerances:

for dimensions up to and including 150 mm.: ± 1·5 mm.

for dimensions greater than 150 mm. and up to and including 600 mm. ± 2 mm.

for dimensions greater than 600 mm.: ± 3 mm.

For the purpose of checking tolerances, the paper or board shall be conditioned under the standard testing conditions specified in B.S. "Method of conditioning paper and board test samples," and measured under those conditions.

Untrimmed Stock Sizes

RA Series

The untrimmed stock sizes of the RA range apply to paper which is intended to be trimmed to the ISO—A series (see Table 1), and will be submitted only to simple conversion operations, *e.g.*, non-bled printing.

(*a*) *Widths of reels* (*RA*). The widths of reels of paper in the RA range shall be one of the following:

43 cm.	16·93 in.
61 cm.	24·02 in.
86 cm.	33·86 in.
122 cm.	48·03 in.

(*b*) *Untrimmed sheet sizes* (*RA*). The untrimmed sheet sizes of paper in the RA range shall be one of the following:

	cm. cm.	in. in.
RA0	81 × 122	33·86 × 48·03
RA1	61 × 86	24·02 × 33·86
RA2	43 × 61	16·93 × 24·02

SRA Series

The untrimmed stock sizes of the SRA range apply to paper which is intended to be trimmed to the ISO—A series (see Table 1), and will be submitted to conversion operations requiring more trim than can be obtained from the RA series, *e.g.*, bled printing.

(*a*) *Widths of reels* (*SRA*). The widths of reels of paper in the SRA range shall be one of the following:

45 cm.	17·72 in.
64 cm.	25·20 in.
90 cm.	35·43 in.
128 cm.	50·39 in.

(*b*) *Untrimmed sheet sizes* (*SRA*). The untrimmed sheet sizes of paper in the SRA range shall be one of the following:

	cm. cm.	in. in.
SRA0	90 × 128	35·43 × 50·39
SRA1	64 × 90	25·20 × 35·43
SRA2	45 × 64	17·72 × 25·20

Tolerances

The untrimmed sizes of the RA and SRA ranges are subject to the following tolerances:

± 0·5 per cent. rounded to the nearest millimetre;

however,

if 0·5 per cent. is greater than 0·5 cm., the maximum tolerance shall be ± 0·5 cm.;

if 0·5 per cent. is less than 0·3 cm., a tolerance of ± 0·3 cm. shall be accepted.

For the purpose of checking tolerances, the paper or board shall be conditioned under the standard testing conditions specified in B.S. "Method of conditioning paper and board test samples," and measured under those conditions.

Packaging and Labelling

Papers in Packages

The measure of quantity for writing, printing and cover papers, offset cartridges and drawing cartridges shall be the ream of 500 sheets. Papers may be supplied either ream wrapped in packages or not ream wrapped on pallets or stillages.

Packages shall contain 500 or 250 sheets according to the size and weight of the paper. Labels on packages shall show:

(*a*) Description.

(*b*) Contents of parcel (*i.e.*, number of sheets).

(*c*) Basis weight in grammes per square metre and weight per 500 sheets in kilogrammes (or in pounds per 500 sheets during the transition period of metricization).

(*d*) Size in millimetres for trimmed sizes, or in centimetres for untrimmed sizes (or in inches if traditional British sizes are supplied).

Boards in Packages

The measure of quantity for index boards, pulp boards, paste boards, duplex, triplex and ivory boards shall be 100 boards. Boards may be supplied in packages or on pallets or stillages.

Packages shall normally contain 100 or 50 boards according to the size and weight of the board. Labels on packages shall show:

(*a*) Description of contents.

(*b*) Quantity (*i.e.*, number of boards).

(*c*) Thickness and/or basis weight in grammes per square metre and weight kilogrammes per 100 sheets (or in pounds per 100 sheets during the transition period of metricazation).

(*d*) Size in millimetres for trimmed sizes or in centimetres for untrimmed sizes (or in inches if traditional British sizes are supplied).

Pallet Loads

In general, pallets and stillages are used only for bulk quantities. Labels on pallets and stillages shall show:

(*a*) Description of contents.

(*b*) Quantity.

(*c*) For papers, basis weight in grammes per square metre (or in pounds per 500 sheets during the transition period of metricization; for boards thickness and/or basis weight in grammes per square metre, and weight in kilogrammes per 100 sheets (or in pounds per 100 sheets during the transition period of metricization).

(*d*) Size in millimetres for trimmed sizes, or in centimetres for untrimmed sizes (or in inches if traditional British sizes are supplied).

Machine Direction

The machine direction of papers and boards shall be indicated by an arrow on the wrapper of each packet.

> *Note:* It is recommended that in documents, such as invoices or orders, the machine direction should be indicated by the letter M after the figure which represents the machine direction.

Traditional British Sizes of Writing and Printing Papers

The following tables give details of traditional British sizes of writing and printing papers which may be needed during the transition to the metric system. It is recommended that their use should be discontinued as soon as possible.

Table 3. Writing and Printing Papers and Offset Cartridges

Designation	Size	Multiplication factor for converting weight in lb./ream (500 sheets) to g./m.^{2}	Multiplication factor for converting g./m.^{2} to lb./ream (500 sheets)
	in.		
Primary sizes			
Foolscap	13½ × 17	6·13	0·163
Foolscap, Double	17 × 27	3·06	0·327
Foolscap, Quad	27 × 34	1·53	0·655
Large Post	16½ × 21	4·06	0·246
Large Post, Double ..	21 × 33	2·03	0·493
Demy	17½ × 22½	3·57	0·280 0
Demy, Double	22½ × 35	1·79	0·560 0
Demy, Quad	35 × 45	0·89	1·120 0
Medium	18 × 23	3·40	0·296
Medium, Double	23 × 36	1·70	0·590
Medium, Quad	36 × 46	0·85	1·180
Royal	20 × 25	2·81	0·358
Royal, Double	25 × 40	1·41	0·716
Crown, Double	20 × 30	2·34	0·426 7
Crown, Quad	30 × 40	1·17	0·853 4
—	30 × 60	0·58	1·706 8
Secondary sizes			
Pinched Post	14½ × 18½	5·24	0·192
Post	15¼ × 19	4·85	0·235
Post, Double	19 × 30½	2·43	0·414
Imperial	22 × 30	2·13	0·417
Poster Paper only	41 × 61	0·56	1·785

Table 4. Drawing Cartridges

Designation	Size	Multiplication factor for converting weight in lb./ream (500 sheets) to g./m.^{2}	Multiplication factor for converting g./m.^{2} to lb./ream (500 sheets)
	in.		
Imperial	22 × 30	2·13	0·471
Elephant, Double	27 × 40	1·30	0·770

NOTE. Attention is drawn to the following British Standards, which deal with reels of paper and with paper cut from reels:
"Engineering drawing practice."
"Drawing office practice for architects and builders."
"Detail drawing paper."
"Cartridge drawing paper."

Table 5. Ledger Papers

Designation	Size	Multiplication factor for converting weight in lb./ream (500 sheets) to g./m.^{2}	Multiplication factor for converting g./m.^{2} to lb./ream (500 sheets)
	in.		
Primary sizes			
Foolscap, Double	17 × 27	3·06	0·327
Foolscap, Quad	27 × 34	1·53	0·655
Foolscap, 1⅓ sheet	13½ × 22½	4·63	0·213
Foolscap, 1½ sheet	13½ × 25½	4·08	0·244
Foolscap, Oblong Double	13½ × 34	3·06	0·327
Ledger Demy	15½ × 20	4·54	0·225
Ledger Demy, Double	20 × 31	2·27	0·443
Ledger Demy, Oblong Double	15½ × 40	2·27	0·443
Ledger Demy, Quad	31 × 40	1·13	0·885
Medium	18 × 23	3·40	0·296
Medium, Double	23 × 36	1·70	0·590
Medium, Oblong Double	18 × 46	1·70	0·590
Ledger Royal	19 × 24	3·08	0·326
Ledger Super Royal	19 × 27	2·74	0·366
Secondary sizes			
Imperial	22 × 30	2·13	0·471
Elephant, Double	27 × 40	1·30	0·770

Table 6. Cover Papers

Designation	Size	Multiplication factor for converting weight in lb./ream (500 sheets) to g./m.^{2}	Multiplication factor for converting g./m.^{2} to lb./ream (500 sheets)
	in.		
Medium	18 × 23	3·40	0·296
Cover Royal	20½ × 25½	2·69	0·372
Cover Double Crown	20½ × 30½	2·25	0·445

Table 7. Index Boards

Designation	Size	Multiplication factor for converting weight in lb./100 boards to g./m.^{2}	Multiplication factor for converting g./m.^{2} to lb./100 boards
	in.		
Index Royal	20½ × 25½	13·45	0·075
Index Royal and a half	25½ × 30½	9·04	0·111

Table 8. Pulp Boards

Designation	Size	Multiplication factor for converting weight in lb./100 boards to g./m.²	Multiplication factor for converting g./m.² to lb./100 boards
	in.		
Pulp Royal	20½ × 25	13·72	0·073
Postal	22½ × 28½	10·96	0·091
Extra Postal	24 × 33½	8·70	0·012

Table 9. Paste, Duplex, Triplex and Ivory Boards

Designation	Size	Multiplication factor for converting weight in lb./100 boards to g./m.²	Multiplication factor for converting g./m.² to lb./100 boards
	in.		
Royal	20 × 25	14·05	0·072
Paste Royal	20½ × 25	13·72	0·073
Postal	22½ × 28½	10·96	0·091
Paste Imperial	22½ × 30	10·42	0·098
—	22½ × 32	9·70	0·103

20. Other Sizes of Papers and Board

The sizes of wrapping papers have been omitted from the British Standard previously detailed. However, in the interest of the student, the following sizes are detailed as being the most popular in current use and normally readily available from most paper merchants. Where a trade name is in current use this also is shown, but, when ordering, dimensions should always be quoted.

Krafts and Browns

in.	
20 × 30	Double Crown
26 × 36	
29 × 45	Double Imperial
36 × 45	Saddleback
36 × 46	Casing
44 × 64	
45 × 58	Quad Imperial
56 × 72	

Fine Wrappings and Tissues

in.	
16 × 24	
16 × 26	
17 × 27	
18 × 28	
19 × 29	
19½ × 29½	
20 × 30	Double Crown

Greaseproof and Glazed Transparent

in.	
18 × 28	
19 × 29	
20 × 30	Double Crown

Similarly the sizes of strawboard, chipboard and millboard are not included in the British Standard. Again those in popular use are as follows:—

Strawboard	*Chipboard*	*Millboard*
in.	in.	in.
20 × 25	24 × 38	25 × 30
20 × 30	25 × 30	26 × 40
25 × 30	28 × 36	30 × 40
27 × 34	30 × 40	
28 × 36	32 × 44	
22 × 32		
24 × 38		
30 × 40		

CHAPTER 7

Envelopes and Bags

The envelope as it is now known dates from the introduction of the penny post in 1840. However, mention was made in contemporary literature of a letter sent in 1640 by the Duke of Saxe Gotha; it was folded in three, then one end tucked into the other, and sealed with wax. *The Oxford Dictionary* records that Swift mentioned the word "envelope" in 1735, but this was probably a reference to an extra sheet folded round the letter as a cover. The first true envelope was the famous "Mulready" which, as a pre-paid envelope for penny post, was sold by the Post Office. It was protected against forgery by silken threads in the body of the paper, an invention which has since been revived in modern banknotes. Becoming the subject of political contention, it was violently attacked and ridiculed, and passed completely out of use upon the introduction of gummed postage-stamps.

In this chapter it is intended to deal with the classes and uses of envelopes, their manufacture and the pertinent Post Office regulations.

Throughout, the terms and sizes used are those laid down by the British Standards Institution, with the co-operation of a committee which included representatives of the British Stationery and Office Equipment Association and of the Envelope Makers' and Manufacturing Stationers' Association. The list of envelope standards which has been prepared is generally recognized in the trade and the nomenclature should always be employed.

Before learning about the classes and uses, it would be advisable for the student to become familiar with some of the more important definitions.

1. Definitions of Envelope Terms

Envelope Styles and Measurements

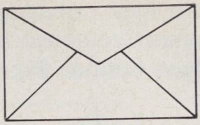
Envelopes are divided into two main styles:—

(*a*) Banker envelopes.
(*b*) Pocket envelopes.

The order of the measurements for length and breadth of an envelope are established in relation to the opening. The first measurement is that which is at right angles to the opening, thus:—

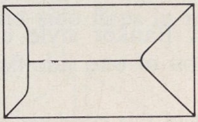
(*a*) *Banker envelopes.* That style of envelope in which the opening and flap are formed on the side having the greater dimension.

Thus the commonly used 3½ in. × 6 in. envelope, *viz.* :— is a "banker" envelope



(*b*) *Pocket envelopes.* That style of envelope in which the opening and flap are normally formed on the side having the lesser dimension, with seam or seams parallel to the longer side.

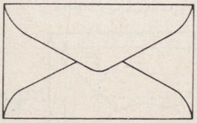
Thus the commonly used 9 in. × 4 in. envelope *viz.* :— is a "pocket" envelope



It is recommended that manufacturers and users should designate envelope sizes by the style and dimensions of the envelopes—*e.g.*, 3½ in. × 6 in. banker or 9 in. × 4 in. pocket.

Envelope Shapes

(*a*) *Commercial.* A general term used for reference to banker envelopes, but excluding court and card shapes.

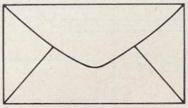


Commercial

(*b*) *Court.* Banker style made to take sizes of notepaper cut from the standard sheets of post, large post, medium, royal.

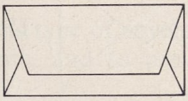
(*c*) *Card.* Size range of banker style envelopes especially suitable for enclosing cards, including greeting cards.

(*d*) *Security.* Banker style distinguished by large overlapping bottom flap, with proportionately lesser-sized side flaps and generous overlapping sealing flaps, *viz.* :—



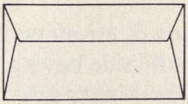
Security

(*e*) *Wallet.* Banker style providing generous bottom-flap overlap of side flaps with straight-edged bottom flap and deep straight-edged sealing flap.



Wallet

(*f*) *Typewriter.* Banker style providing a sub-division of wallet shape and furnishing almost complete bottom-flap overlap of side flaps with a straight-edged bottom flap and narrow straight-edged sealing flap.

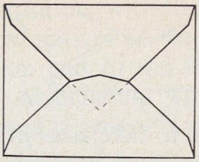


Typewriter

(*g*) *Open-end wallets.* Banker style exactly similar to ordinary wallet, but with provision of one side flap left unsealed.

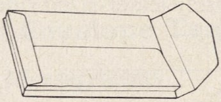
NOTE. The unusual form of this envelope in sealed condition provides an exception to the definition of banker style, but this form, together with similar forms as half-flap gummed banker shapes, etc., are obvious evolutions of the original form, and are accordingly grouped in their original style as banker envelopes.

(*h*) *Tuck flap.* This is a banker style envelope. The special long, narrow sealing flap tucks neatly and safely into the lower half of the envelope. A variety of trade names is used by manufacturers to describe this style.



Tuck flap

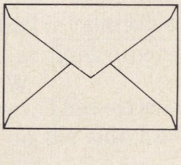
(*i*) *Gusset.* Banker or pocket shape providing extra capacity by means of accordion pleat or pleats.



Gusset

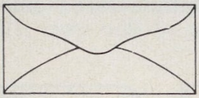
Envelope Cuts

(*a*) *Diamond flap.* That cutting of the top flap which terminates in a point.



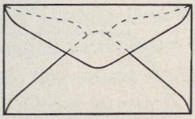
Diamond flap

(*b*) *Round flap*. That cutting of the flap which provides a shaped or rounded nose and usually associated with rounded sides of the sealing flap.

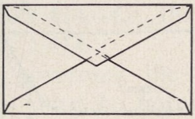


Round flap

(*c*) *High-cut, extra-high-cut and low-cut*. Relative terms to describe the height of the bottom and side flaps in relation to the opening.

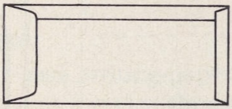


High cut

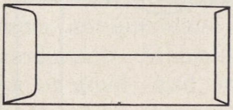


Low cut

(*d*) *Seams*. Pocket envelopes are available with either side seams or a centre seam.



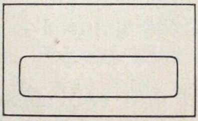
viz.:—side seam



viz.:—centre seam

Window, Aperture and Anti-trap Envelopes

(*a*) *Window envelope*. An envelope in which a transparent "window" is provided of a separate material, or a portion of the paper is treated to provide transparency. A variety of trade names is used by manufacturers to describe varying types of transparent materials.

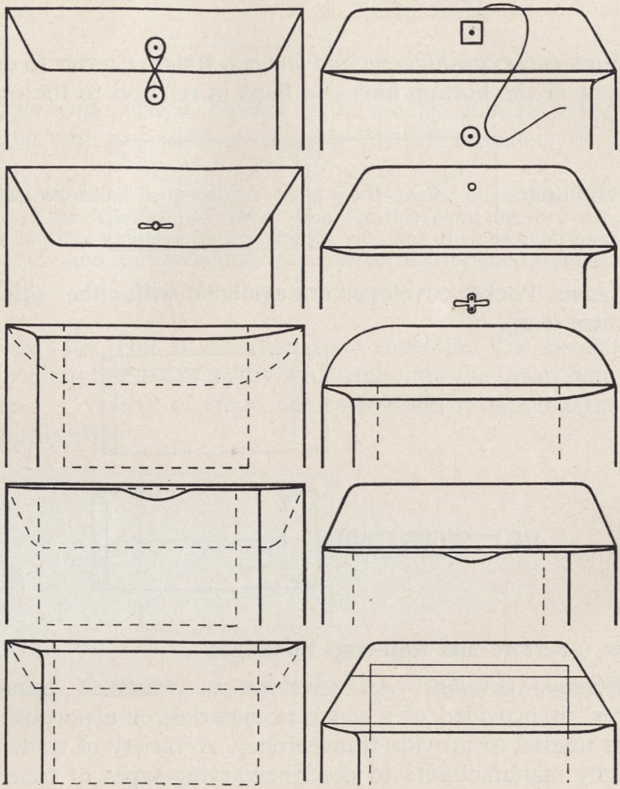


Window

(*b*) *Aperture envelope*. An envelope provided with a cut-out in a portion of its face so that the address may be read, but without the provision of any covering material.

(*c*) *Anti-trap envelopes*. This type of envelope is designed to allow easy examination of contents, and to prevent the entrapping of smaller envelopes.

The Printed Paper Rate service, which had particular application to anti-trap envelopes, will cease to operate with the introduction of the two-tier service on 16th September, 1968. This type of envelope however, will continue to be manufactured unless demand falls to uneconomical production levels.



Examples of Anti-trap Envelopes

2. Classes and Uses

Envelopes are mainly divided into two classes—those which are produced to match notepapers and writing pads, and those which are used for commercial purposes.

(1) Private or personal envelopes.

(2) Commercial envelopes.

  (*a*) Pocket style.

  (*b*) Banker style.

From 16th September, 1968, all envelopes sent through the post with contents weighing 4 oz. or less will have to conform to the Post Office Preferred (POP) range for acceptance at the preferred rate of postage. Sizes outside this range may be used, but with effect from the autumn of 1969, they will be subject to an additional postage charge.

The size range is:—

$3\frac{1}{2}$ in. × $5\frac{1}{2}$ in. (90 mm. × 140 mm.) to $4\frac{3}{4}$ in. × $9\frac{1}{4}$ in. (120 mm. × 235 mm.).

Any size within this range will be acceptable *provided that the ratio of width to length is not less than* 1 *to* 1.414—*i.e.*, the length must not be less than the width multiplied by 1.414.

Full details of the conditions governing the POP range are given separately. These regulations must be borne in mind when considering envelope sizes whose contents will weigh less than 4 oz. In general terms this covers the bulk of banker styles, either personal or commercial, currently in use.

"Private" or "Personal" Envelopes

Envelopes to match note-paper and writing-papers are normally sold with the paper they match, or as a replenishment of supplies to match paper already purchased. They are, therefore, made from high-quality papers—bonds, vellums, antique-laids, highly finished cream-laids and woves or rag-parchments. Many of these papers have special finishes—linen, crash or anvil—and, in addition, are supplied in several different tints. Special watermarked papers are also used, and often the envelopes have a deckle-edged finish to match the note-paper. As the best rag papers are strong, with a clear look-through, it is often necessary to increase the opacity of the envelopes made from them. This is done by inserting linings of coloured tissue, or more commonly by printing an opaque design on the inside. Light-weight papers used for air mail envelopes also require this method of printing to render them sufficiently opaque.

Private envelopes are supplied in a number of different shapes or "cuts," all of a style in keeping with the qualities of the paper used in their manufacture. Popular cuts are diamond-flap and wallet-shape, and each in its way adds character to the envelope. The banding and boxing of these envelopes is subject to variation by different manufacturers, usually to meet a retail price unit.

Commercial Envelopes

As the name implies, this class of envelope is mainly used for commercial and business purposes, although many new uses have been found for these envelopes and they will be mentioned later in this chapter.

Commercial envelopes are divided into two main styles—"banker" envelopes and "pocket" envelopes. As previously explained, the name banker envelope is used to define in general terms that style of envelope in which the opening and flap are formed on the side having the greater dimension. A pocket envelope is that style of envelope in which the opening and flap are formed on the side having the lesser dimension, with the seam or seams parallel to the longer side.

The order of the measurements for length and breadth of an envelope is established in relation to the opening. The first measurement is that which is at right angles to the opening. Thus 3½ in. × 6 in. is banker-shaped and 6 in. × 3½ in. is pocket-shaped.

As pocket and banker styles differ widely in their application and uses, it will be more convenient to consider them separately.

(a) Pocket Style: Pocket style envelopes are made from many different grades of paper, the most popular being M.G. manilla in varying substances, strong cartridge, kraft and linen-lined papers. Glassine papers are also freely used for packaging envelopes and certain types of wage envelopes. The range of sizes in use varies from small pockets (2¼ in. × 2¼ in.) to large pockets (16 in. × 12 in.). This range of sizes may be divided into three groups:—

(1) Small pockets: Sizes from 2¼ in. × 2¼ in. up to 6 in. × 4 in.
(2) Long pockets: „ „ 9 in. × 4 in. „ „ 15 in. × 6 in.
(3) Broad pockets: „ „ 6½ in. × 4 in. „ „ 16 in. × 12 in.

Small Pockets: The majority of envelopes made in this size range are used for wages purposes. A number of standard styles are provided from stock by manufacturers and many millions of "specials" are made each year. The most popular stock sizes (between 4¼ in. × 2¾ in. and 6 in. × 4 in.) are usually available plain or printed with standard wording, suitable for completion in manuscript, showing gross wages, various standard deductions and net wages. Wage envelopes are available with either gummed or latex sealing flaps, but it is safe to assume that most wage envelopes now in use are of the latex sealing variety.

Other uses for small pockets include pence pockets, seed pockets, charity collection envelopes, and packaging envelopes for a variety of articles. It should be noted that any envelope smaller than 4 in. × 2¾ in. cannot be sent through the post and that sizes above this will be subject to the POP regulations from 16th September, 1968.

Long Pockets: The size range under this heading caters for office and home requirements of sizes suitable for folding many kinds of documents the "long way." The most popular size is 9 in. × 4 in.

In everyday use in offices it is a very good second in annual consumption to the 3½ in. × 6 in. commercial envelope. This size is also normally available with either aperture or window front.

Generally the term "long pocket" is used when the smaller dimension is half or less than half the longer dimension. Otherwise the term "broad pocket" is used.

In the legal profession particularly, certain sizes in this range have acquired names:—

9 in. × 4 in. is called foolscap.
11 in. × 5 in. is called draft.
14 in. × 5⅛ in. is called brief.
15 in. × 6 in. is called extra draft.

These names are gradually going out of common use, and there is also a lack of consistency in the sizes designated by such terms. For these reasons it is always advisable to order in actual dimensions or by quoting the manufacturer's reference number.

Gummed flaps for sealing are currently the most popular but, in certain sizes, latex sealing flaps are also available.

Broad Pockets: The very wide range of sizes incorporated under this heading cover all the many and varied requirements of office and home. To try to define the use for any particular purpose would be futile, but among the more common enclosures are catalogues, bulky correspondence, photographs, calendars, etc.

All manufacturers supply a very wide range of qualities and sizes designed to meet all normal needs. For the flap sealing, mainly gum is used, but latex sealing is also available in most sizes.

Subject to certain conditions, which are clearly defined in the Post Office regulations, it is permissible to send envelopes through the post unsealed.

To meet these regulations a variety of styles of envelope has been introduced. The most common pocket style is that in which the flap is either tucked or locked into a pocket formed by a second internal flap. Most of these styles of pocket-shaped envelopes are incorporated in the broad pocket stock range of most manufacturers.

For heavier weight enclosures, varied types of fasteners are used—*e.g.*, metal prongs, washer and string, etc. (see illustration per page 350).

(b) Banker Style: Banker style envelopes are made from papers similar to those used for pocket envelopes, but qualities are generally thinner. White or cream-laid, white or cream-wove, and parchment papers are used to a greater extent.

The range of sizes in use varies from 3⅛ in. × 5⅜ in. to 7¼ in. × 9¼ in., and this range may be divided into two groups:

(1) Commercial bankers;
(2) Court and card bankers.

Commercial bankers range in size from 3⅛ in. × 5⅜ in. to 4 in. × 9 in. and are all roughly oblong in shape. Court and card bankers range in size from 3¾ in. × 4¾ in. to 7¼ in. × 9¼ in., and are roughly square in shape and **do not** conform to the Post Office Preferred (POP) range.

Banker envelopes are supplied in a variety of cuts, and most of the names are self-explanatory. The most common are described and illustrated in section 1 of this chapter.

There is a growing interest in the International Standard Organization range of sizes known as the "A" series, full details of which are given in the appropriate British Standard. Two of these sizes, C6 114 mm. × 162 mm. (4·5 in. × 6·4 in.) and DL 110 mm. × 220 mm. (4·3 in. × 8·7 in.) are stocked by most manufacturers in both plain and window styles. A list of envelope sizes is given towards the end of this chapter.

For use with commercial letterheadings, a style of 4 in. × 9 in. banker envelope has become very popular. It is usually made in the "secure" shape, and from papers which match the heading to be enclosed. Added dignity is given to this envelope by the use of colour relief stamping, in the style of the letterheading.

Aperture and Window Envelopes

Both pocket and banker styles may be made with either "aperture" or "window" fronts.

"Aperture" (or "cut-out") envelopes have an oblong section of the front cut out so that part of the enclosure is visible. If the enclosure is addressed so that, when it is folded and inserted into the aperture envelope, the address is on the visible portion, the need for typing a separate address on the envelope is eliminated. The maximum aperture size permitted by the Post Office is 3¾ in. × 1¼ in., and there must be a minimum space of 1½in. between the top of the aperture and the top of the envelope, and a minimum space of at least ½ in. must be left between the sides and base of the cut-out panel and the respective edges of the envelope.

Aperture envelopes irrespective of their size and shape, will be classed as outside the Post Office Preferred (POP) range after 16th September, 1968.

If an oblong of transparent paper is pasted behind the cut-out portion, the address is still legible and added privacy and security are obtained. The envelope is then called a "window" envelope. The 1½ in. minimum space between the top of the window and the top of the envelope mentioned above applies also to window envelopes, and manufacturers normally require a space of ½ in. from any other edge for machine folding purposes. Window envelopes **will** be accepted at preferred rates of postage provided that the envelope size conforms to the regulations.

Full details governing the size and position of aperture and window envelopes are given later under Post Office regulations.

Air mail Envelopes

Light-weight papers are essential for air mail envelopes owing to the high postage cost based on weight of mail. Air mail envelopes are, therefore, made up in very thin, strong papers which are sometimes printed inside for opacity. Some are supplied with red and blue border on the face and back and printed "By Air Mail" in blue in the top left-hand corner of the face.

3. Manufacture

Cutting

To follow the process of manufacture, an envelope should be unfolded and laid out with all its flaps opened. It will then be in its original form—as a "blank." Blanks are cut from "wads'" or piles of paper by shaped steel knives (called "cutters") under heavy presses, except when the envelope is made from the reel (see paragraph "Machining"). If a pocket-shaped envelope has been used (*i.e.*, that style of envelope in which the opening and flap are found on the side having the lesser dimension, with the seam or seams parallel to the longer side) and the blank is placed upon a square sheet of paper, it will be seen that it is possible to cut this style of envelope from such a sheet with very little waste. If, however, the blank is banker-shaped (*i.e.*, that style of envelope in which the opening and flap are found on the side having the greater dimension), it will be realized at once that were this style cut from such a sheet a large amount of waste would occur. Banker-shaped blanks are, therefore, cut from "angle-sheets"—that is to say, from paper cut to special angles in order to reduce this waste.

Hand-cutting

In spite of the standardization of envelope sizes and shapes, there is an occasional demand for small quantities of special-sized envelopes. As an envelope cutter costs at the present time anything from £30 to £50 it is too costly to make a special cutter for any quantity under 100,000, and recourse is therefore made to "hand-cutting." For this purpose an oblong sheet of paper is used. It is cut by a guillotine to a square or oblong the overall size of the blank, and adjustable angular chisels are used to cut out the corners to form the shape of the envelope blank. A hand-cut envelope is always recognizable by the corners, which are sharp—not rounded, as in the case of a machine-cut envelope.

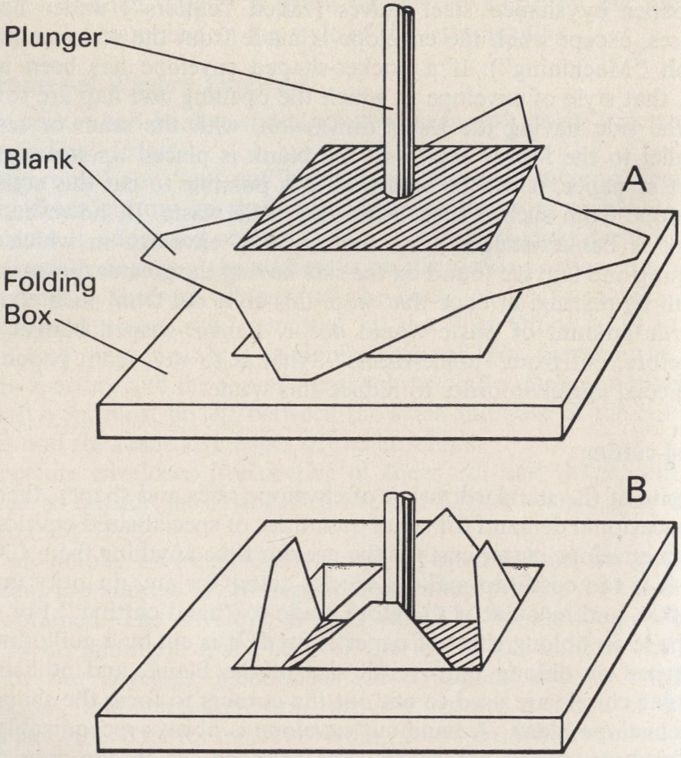
Machining

There are four methods of making envelopes, and these are:—

(*a*) Plunger folding;
(*b*) Rotary folding;
(*c*) Straight from the reel;
(*d*) Hand manufacture.

(a) Plunger folding

Blanks are fed automatically into the machine, where the first operation is the gumming of the sealing flap. This is carried out by a shaped rubber pad which dabs the gum on to the flap. The blank is then drawn into the machine and gum applied to the bottom tail flap. The gummed blank is moved over a square hole with its four flaps overlapping the edges, and a square plunger, the exact size of the folded envelope, comes down, forcing the blank through the hole or "folding-box." Whilst it is passing through, side-wings operate



Principle of a Plunger envelope folding machine which turn over the side and bottom flaps, sealing them to make a completed envelope. The top flap is kept away from the folded envelope, for the gum on it is still wet, and the envelope drops down into what is known as "the chain." This moves slowly round the back of the machine over heat to dry the gum on the sealing flap. The chain also grips the bottom flap and holds it until the seams are dry. As the envelopes come from the machinery on to the delivery table they are counted automatically, banded, and either packed or boxed.

(b) Rotary folding

In contrast to the plunger style of folding—*i.e.*, forcing or plunging the blanks into a "folding box"—the general principle of folding by the rotary method is by the "ploughing over" or the "turning over by guides" of the seams and flaps. It is necessary to state that there are several machines of varying types of construction capable of this rotary method of folding according to which some operations differ slightly. However, the following sketch and sequence of operations will enable the general principle of rotary folding to be followed.

SKETCH OF MACHINE

No. 1. The forming of the first fold and the drawing of the blank into the machine.

No. 2. In this space the blank is registered to ensure it being in the correct position to receive the pre-creasing for the remaining folds.

No. 3. Application of gum along the seam, after which the blank moves forward to registered stops and is then pushed forward into the folding rollers for the second fold.

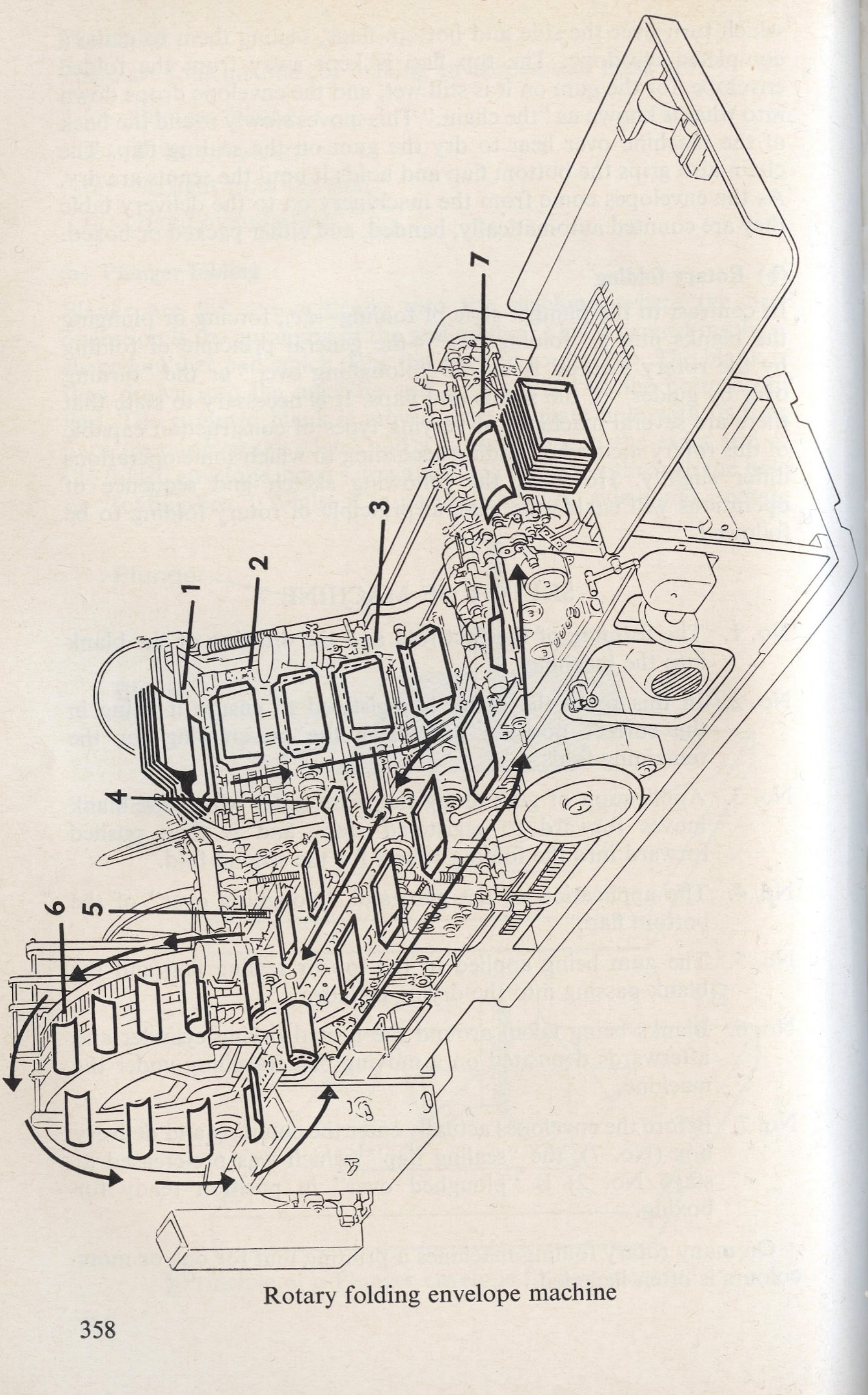
No. 4. The application of the gum and "ploughing over" of the bottom flap.

No. 5. The gum being applied to the top or sealing flap and the blank passing into the drying cylinder.

No. 6. Blanks being taken around the heated drying cylinder and afterwards deposited on a moving belt travelling under the machine.

No. 7. Before the envelopes actually enter the counting and delivery box (No. 7), the "sealing flap" (which was pre-creased at stage No. 2) is "ploughed over" in position ready for boxing.

On many rotary folding machines a printing unit for one or more colours is often included.



Rotary folding envelope machine

(c) Reel folding

A reel of paper is mounted at one end of the machine and from this the blanks are cut and automatically fed into the machine, thus eliminating the separate cutting operation. After the blanks enter the machine, the methods of folding generally follow the same sequence as that described under "rotary folding" above.

Printing units for one or more colours are built into many of these machines, and aperture and window envelopes can also be made in one operation straight from the reel.

Reel-fed equipment is normally employed on standard productions and very long runs.

(d) Hand manufacture

Although machinery is used to make most envelopes, there are still some which are made by hand. Envelopes for high-class stationery are sometimes cut, folded and gummed entirely by hand, but this method is mainly used for certain special-sized envelopes where machinery for their manufacture is not available or the quantity required is too small for an economical machine run. Hand-cut envelopes are not always suitable for folding on modern machinery and are usually hand-gummed and hand-folded. Block-bottomed and gusset bags are also frequently made by hand owing to their complicated nature. The seams of a hand-folded envelope are sealed right to the edge and the adhesive used is paste, as gum spreads and disfigures the finished article. The flap of a hand-folded envelope is usually hand-gummed.

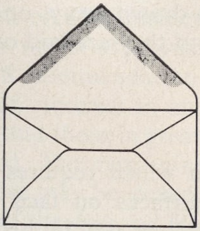
Sealing Methods

These fall into the following three categories:

(a) Machine gumming

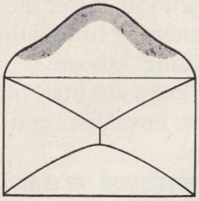
Various styles of flap gumming are used and the terms in general use are:—

(*a*) *Edge gumming*. Gumming which conforms in shape to the contour of the flap.



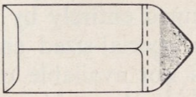
Edge gumming

(*b*) *Shaped gumming*. Similar to edge gumming, but rounded in contour for appearance and usually widened to provide extra security.



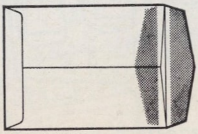
Shaped gumming

(*c*) *Gummed across flap* (*G.A.F.*). Gumming which provides a generous width of adhesive across the flap as distinct from shaped gumming.



Gummed across flap

(*d*) *Gummed face and body*. The application of a coat of gum to the sealing flap and to a corresponding area of the body of the envelope to ensure speedy adhesion on certain strong papers—*e.g.*, cloth-lined, or papers, such as glassine, where gum penetration is difficult.



Gummed face and body

(b) Hand-gumming

Envelopes may also be hand-gummed, and this is almost always the case with hand-folded envelopes.

The pile of blanks to be hand-gummed is placed under a brass bar with a strip of felt attached, so that the bar divides the portion of the flap to be gummed from the rest of the envelope. Gum is dripped on to the felt and the blanks are drawn away, one by one; the felt deposits the gum on their flaps and they are laid out to dry in racks or passed under infra-red lamps.

(c) Latex Sealing

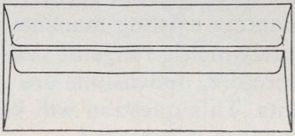
Latex is a rubber-based solution which requires no moisture for sealing. The two latex-treated surfaces on face and body, when brought into contact with one another, seal immediately.

This method has been applied to both banker and pocket envelopes, and its outstanding merits are:—

(*a*) Hygiene—no licking of the flaps is necessary;

(*b*) Quick sealing—the two areas of latex fuse together immediately upon contact;

(*c*) Immediate security.



Latex sealed Envelope

It must be carefully borne in mind that latex envelopes, even if they are of the type with a protective flap, must at all times be stored in dry, dust-free conditions and protected from extremes of temperature.

Order clerks should be instructed to ensure a steady turnover of stock, and stock-keepers should be warned to use stocks in strict rotation.

Printing and Stamping

Many envelopes used for commercial purposes are printed or die-stamped with the customer's business title and address.

Printing: The usual form of printing is by letterpress set from type and blocks or a mixture of both. Bulk orders for standard productions or for specials can be printed on certain folding machines, and when this method is employed aniline ink is used.

Die-stamping: The embossing die(s) can be either plain (or blind) relief, colour relief or cameo relief in style and colour to meet individual needs.

Position of Printing or Stamping

The printing or stamping is normally positioned on the sealing flap or at the left-hand side of the face. When considering the position care should be taken to comply with Post Office regulations.

Envelopes used for business reply purposes must be printed in the manner laid down by the postal authorities, as detailed later under the appropriate heading.

4. British Standard sizes

A previous edition of BS Commercial envelopes (terms and sizes), gave details of a range of envelope sizes that was subsequently incorporated in a Recommendation of the International Organisation for Standardisation. Interest in and demand for certain of the ISO sizes is now such, that those in greatest common use are incorporated in a new standard. The remaining sizes are shown in a separate table; some of these may be included in the specification itself when it is next revised, if the demand from users appears to warrant this.

The desirability of preparing British Standards entirely in the metric system had not been overlooked. However, the possibility of further changes in postal requirements, coupled with the problems of adapting existing machinery, make it impracticable to introduce a purely metric range of sizes at this juncture. As an interim measure, therefore, dimensions are given in millimetres and English equivalents. This question will be reviewed when the next revision of the standard is prepared.

Particular attention is drawn to the fact that, while ISO procedure gives the smaller dimension first, regardless of whether the envelope is of banker or pocket shape, this standard retains the traditional British practice of expressing dimensions, *i.e.*, the first dimension is that at right angles to the opening.

A British Standard on "Envelopes for local authorities" specified certain quality requirements for envelopes for use by local authorities. As there is now no demand for these special characteristics, envelopes for local authority use can now be regarded as covered by this British Standard.

Key Sizes of Envelopes

The sizes given below are established as "key" sizes. Although the dimensions are given in millimetres, it is emphasized that, during the transition period towards the full adoption of the metric system in the United Kingdom, these dimensions may in some instances be slightly less accurate than the inch equivalents shows; this does not apply to the ISO sizes, where the reverse applies. In any case, manufacturers' machinery precludes the possibility of an exact standard, and variations of ± ⅛ in. may occur.

ISO envelope sizes not at present included in the B.S. are listed separately.

Type of envelope	Dimensions	
	mm.	in.
Banker	89 × 152*	3½ × 6
	89 × 194*	3½ × 7⅝
	95 × 165*	3¾ × 6½
	102 × 229*	4 × 9
	110 × 220* (DL)†	4¼ × 8⅝
	114 × 162* (C6)†	4½ × 6⅜
	152 × 229	6 × 9
Small Pocket, Packaging, and wages pockets	57 × 57‡	2¼ × 2¼
	89 × 95‡	3½ × 3¾
	98 × 64‡	3⅞ × 2½
	108 × 67‡	4¼ × 2⅝

Type of envelope	Dimensions	
	mm.	in,
	108 × 79	4¼ × 3⅛
	105 × 102	4⅛ × 4
	108 × 92	4¼ × 3⅝
	121 × 73	4¾ × 2⅞
	121 × 92	4¾ × 3⅝
	127 × 102	5 × 4
	152 × 102*	6 × 4
	165 × 102*	6½ × 4
Long Pockets	194 × 89*	7⅝ × 3½
	220 × 110* (DL)†	8⅝ × 4¼
	229 × 102*	9 × 4
	235 × 120*	9¼ × 4¾
	267 × 114	10½ × 4½
	279 × 127	11 × 5
	305 × 127	12 × 5
	356 × 130	14 × 5⅛
	381 × 152	15 × 6
Broad pockets	162 × 114* (C6)†	6⅜ × 4½
	178 × 114*	7 × 4½
	190 × 127	7½ × 5
	216 × 140	8½ × 5½
	229 × 152	9 × 6
	241 × 165	9½ × 6½
	254 × 178	10 × 7
	267 × 203	10½ × 8
	270 × 219	10⅝ × 8⅝
	292 × 235	11½ × 9¼
	305 × 254	12 × 10
	324 × 229 (C4)†	12¾ × 9
	330 × 279	13 × 11
	356 × 229	14 × 9
	381 × 254	15 × 10
	406 × 305	16 × 12

* Sizes falling within the POP range, subject to minimum paper weight regulation, *i.e.* 63 G/M^2.

† ISO sizes.

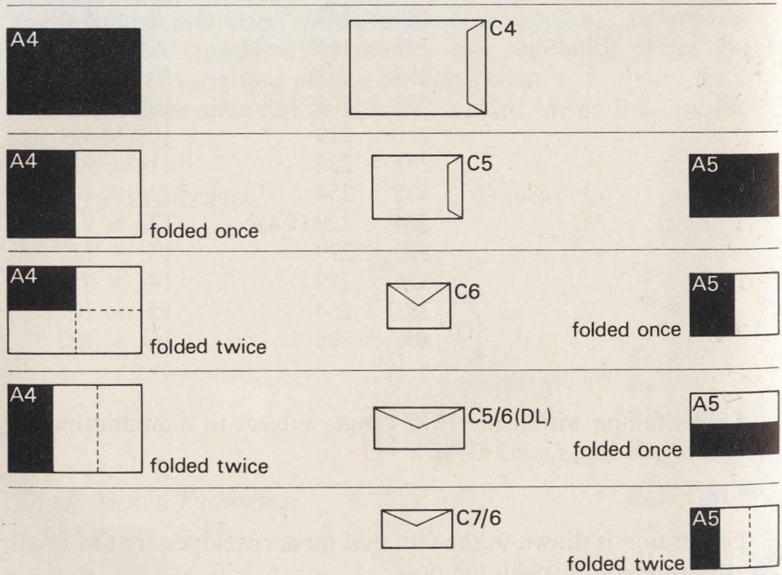
‡ Attention is drawn to the fact that these envelopes are too small for transmission through the post.

ISO Sizes not included in the British Standard

The following sizes of envelopes are included in ISO Recommendation "Sizes of correspondence envelopes and pockets," but are not included in the British Standard because the demand for them in the United Kingdom has so far been negligible. It is recommended that any user needing an envelope of a size not specified in the previous table should first consider the possibility of adopting one of these ISO sizes. If it is found that demand for any of these sizes increases, an appropriate adjustment will be made when this British Standard is next revised. The sizes are given as in standard ISO procedure, i.e. smallest dimension first, regardless of whether the envelope is banker or pocket shape, which is indicated separately.

Symbols	Dimensions	
	mm.	in.
C3	324 × 458	12·76 × 18·03
B4	250 × 353	9·84 × 13·90
B5	176 × 250	6·93 × 9.84
C5	162 × 229	6·38 × 9·02
B6/C4	125 × 324	4·92 × 12·76
B6	125 × 176	4·92 × 6·93
C7/6	81 × 162	3·19 × 6·38
C7	81 × 114	3·19 × 4·49

The ISO sizes are subject to a tolerance of ± 1·5 mm. (or 0·125 inches).



A few examples of A.4 and A.5 sizes folded to fit international size envelopes

5. Post Office Preferred Envelopes

For many years the post offices of the world have been concerned with the problem of efficiently and speedily handling the mails, for there is a constant increase in postal traffic. To deal with the situation, mechanization on a very extensive scale has been introduced. Inevitably this has created difficulties, for, although the machinery is highly ingenious, it has certain limitations.

The first of these is that when the sorting process is taking place the machine must be able to differentiate between the long and short sides of the envelope so as to turn it into the position where the special "scanning" device can read the address. However, the machine cannot do this with a square envelope or a near square envelope such as the court size, so that minimum ratio of length to width has to be adopted. The second limitation was the physical size of the envelope with which the machine could deal, and minimum and maximum limitations had to be introduced. It can be said, however, that such is the skill of the engineers that as time goes on almost certainly it will be possible to increase the upper limit.

At a meeting of the Universal Postal Union held in Vienna in 1964 certain proposals put forward by the Executive Committee of the U.P.U. were considered in respect of the size, shape and weight of envelopes. A resolution was adopted and under Universal Postal Union arrangements the proposals adopted in Vienna will be submitted to the next Postal Congress which will take place in 1969 or 1970; if they are then approved, after an interval of three years they will become mandatory throughout the world.

Nevertheless, this does not preclude a national postal administration from implementing these proposals at an earlier date with regard to its own internal regulations, and Germany, Belgium and the United Kingdom have already done so. The following is a summary of the regulations which will apply in the U.K. with effect from 16th September, 1968.

Post Office Preferred (POP) Range

To fall within the range envelopes should be:

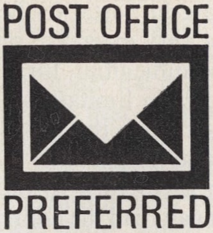
(*a*) at least 3½ in. × 5½ in. (90 mm. × 140 mm.) and not larger than 4¾ in. × 9¼ in. (120 mm. × 235 mm.);*

(*b*) oblong in shape, with the longer side at least 1·414 times the shorter side;

(*c*) made from paper weighing at least 63 grammes per square metre.

* The two most popular International size envelopes, DL (110 mm. × 220 mm.) and C6 (114 mm. × 162 mm.), are within the POP range.

As time goes on, more and more packets and boxes of envelopes within the POP range will bear this special mark.



Post Office Preferred symbol

Higher Postage for other Envelopes

Envelopes outside the Preferred Range may still be used, **and mail weighing more than 4 oz. will be unaffected by the choice of envelope**. But mail weighing **up to 4 oz.**, posted in envelopes outside the Preferred Range, will be liable to a higher charge, though this will not be imposed before the autumn of 1969.

Post Cards

Postcards will be treated as letters and as if they had been posted in an envelope of the same dimensions as the card itself. Postcards outside POP sizes and those sent folded with the edges not sealed together will require the higher postage. Postcards must not be less than 1/100 in. thick.

"Aperture" Envelopes

Irrespective of their size and shape, all "aperture" envelopes (that is, envelopes where cut-out address panels are not covered with a transparent material) will be classed as outside the POP range.

"Window" Envelopes

"Window" envelopes (where cut-out address panels are covered with transparent material) will be treated as falling within the POP range provided they conform in size, shape and weight of paper.

Unenveloped Matter

All unenveloped matter weighing up to 4 oz., except cards, will be classed as outside the POP range and will be liable to the higher postal charges. Fold-and-tuck forms and items enclosed in wrappers are in this category. Folders and letter-cards with all the open ends sealed down will, however, be treated as falling within the POP range provided they conform in size, shape and weight of paper.

Overseas Mail

The Post Office hopes that envelopes within the POP range will be used wherever possible (though it accepts that light-weight paper should continue to be used for air mail envelopes). For the time being no additional charge will be made for oversea mail outside the Preferred range of envelopes. The maximum size of card qualifying for postcard rate in the overseas service remains $4\frac{1}{8}$ in. × $5\frac{7}{8}$ in. (105 mm × 150 mm.).

6. Post Office Regulations (Inland Post)

The following are some of the principle regulations concerning inland letter post. Reference should also be made to the regulations governing Post Office Preferred Envelopes preceding this section, and the official Post Office Guide.

(a) Letters

Weight and Size

There is no limit of weight in the first class service but second class mail is restricted to a maximum of $1\frac{1}{2}$ lbs.

The limits of size are:

Maximum

2 ft. in length, 18 in. in width and 18 in. in depth; or if made up in the form of a roll, 3 ft. 3 in. for the length and twice the diameter combined, and 2 ft. 8 in. for the greatest dimension.

Minimum

Envelopes less than 4 in. in length by $2\frac{3}{4}$ in. in width must not be used.

(b) Postcards

Size

No card may exceed $5\frac{7}{8}$ in. in length by $4\frac{1}{8}$ in. in width or be less than 4 in. in length by $2\frac{3}{4}$ in. in width. The material for private cards to be used as postcards must be ordinary cardboard or paper not less than $\frac{1}{100}$ in. thick and not more flexible than the postcards sold by the Post Office.

Conditions

Nothing may be attached to a postcard except:

1. Stamps in payment of postage or stamp duty;
2. A label or strip of paper completely adherent to the card, and bearing the name and address of the addressee;
3. A similar label (not to exceed 2 in. long and $\frac{3}{4}$ in. wide), bearing the name and address of the sender of the card; and

4. Engravings, drawings, photographs and printed matter on very thin paper and completely adherent to the card.

The articles may be affixed either to the back of the card or to the left-hand half of the address side.

The right-hand half of the address side is reserved exclusively for the postage stamp and the address. Contravention of this regulation may result in the card being withheld from delivery. In the case of picture postcards a margin not less than $1\frac{1}{2}$ in. deep across the top of both the address and correspondence panels should be left for postmarking purposes.

(c) Registered Newspapers

Special conditions will apply to postings by publishers or their agents.

(d) Business Reply Service

Description

Under this service a person who wishes to obtain a reply from a client without putting him to the expense of paying postage, may enclose in his communication an unstamped reply card, letter card, envelope, folder or gummed label of the special design shown below. He may also incorporate in his advertisements in newspapers and other publications a special design to be used as an address label or as a folder. The client can post the card and so on, in the ordinary way, but without a stamp; and the addressee will pay the charges on all the replies he receives.

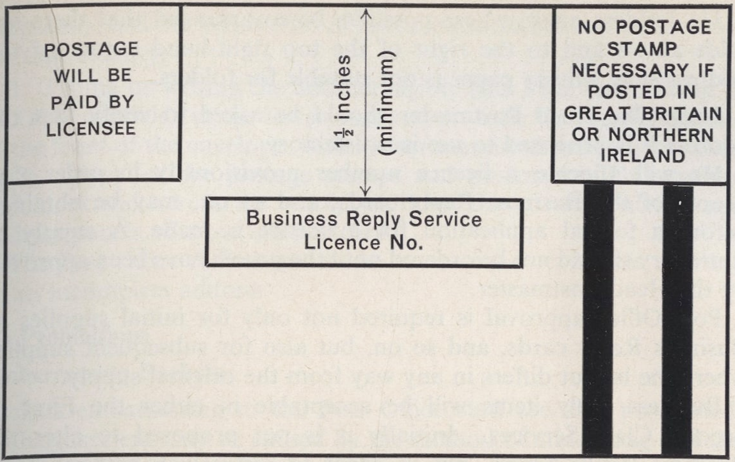
Irish Republic. This service does not extend to the Irish Republic.

Conditions

Licence: Before any person uses business reply cards and so on, a licence must be obtained from the local Head Postmaster.

Deposit: The licensee will be required to pay in advance a sum of money (not less than 10s.), sufficient to cover the amount of the charges likely to accrue during a period of approximately a month, and when the sum so paid is exhausted or nearly exhausted, the licensee will be required to make a further payment to renew his credit.

Design of cards etc.: Complete printed proofs of the cards and so on (or, exceptionally, finished drawings of actual size if the cards and so on are to be printed from plates), conforming to the following design and relative other detail given at 1 to 11 below must be forwarded to the local Head Postmaster for approval:


POSTAGE WILL BE PAID BY LICENSEE
1½ inches (minimum)
NO POSTAGE STAMP NECESSARY IF POSTED IN GREAT BRITAIN OR NORTHERN IRELAND
Business Reply Service Licence No.

Business reply printing

1. The design must be less than 4 in. long by 2¾ in. wide;

2. The name and full postal address of the licensee must be printed parallel to the length of the card, etc., below the panel containing the licence number. The address must be clear and correct with the name of the post town printed in BLOCK capitals. (*See Method of Address.*)

3. A space of not less than 1½ in. must be left between the top edge and the top of the licence number panel;

4. The words *No postage stamp necessary if posted in Great Britain or Northern Ireland* must be printed in the top right-hand corner;

5. The words *Postage will be paid by Licensee* must be printed in the top left-hand corner. The name of the licensee may be used instead of the word *Licensee;*

6. There must be two wide vertical lines near the right-hand edge. Nothing other than the design, licence number and address may appear on the address side;

7. The design and address should preferably be printed in black but any deep colour (for example, green, blue or brown), except red, orange or yellow, will be accepted provided that the printing is in strong contrast with the colour of the card or paper. (See also *Prohibitions.*)

8. The printing on cards and so on for transmission at the printed paper rate must not be in imitation of typewriting;

9. Cards must be material not less than $\frac{1}{100}$ in. thick and not more flexible than the postcards issued and sold by the Post Office;

10. Labels must be printed on paper which will readily take an adhesive substance and which is not too thick to admit of the label being securely pasted down;

11. Folders must, where possible, be so arranged that there are folds above and to the right of the top right-hand corner of the address side. Flimsy paper is not suitable for folders.

Note: The Head Postmaster should be asked to verify that the address it is proposed to use is satisfactory.

He will allocate a licence number provisionally in order that proofs of the Business Reply cards, and so on, may be obtained before a formal application for a licence is made. A supply of stationery should not be ordered until the proofs have been approved by the Head Postmaster.

Post Office approval is required not only for initial supplies of Business Reply cards, and so on, but also for subsequent supplies where the layout differs in any way from the original supply.

Business reply items will be acceptable in either the First or Second Class Services. Initially it is not proposed to alter the Business Reply design, but in order to distinguish between First and Second Class Service, superinscription will be necessary. On existing stocks of stationery the superinscription need only be applied to items which it is desired to have returned by the First Class Service; it should consist of the words "First Class" in characters not less than 1/10 in. high and should be placed immediately to the left of the box enclosing the words "No postage stamp necessary," etc. It should not extend more than 7/16 in. from the top of the item and may be either in the form of a sticker, a rubber stamp impression or a manuscript addition. Any new stationery which is ordered should have the legend "First Class" or "Second Class" incorporated at the printing stage.

(e) Method of Addressing

Considerable information is given in the *Post Office Guide* on the correct addressing of correspondence, and space is not available to detail all the requirements. The following suggestions, however, have been extracted:

Suggestions to avoid delay: Delay to correspondence and mistakes in delivery are due mainly to the use of incorrect or incomplete postal addresses. The Postmaster General therefore appeals to members of the public to co-operate with the Post Office in preventing delay by:

1. Displaying their own correct postal address on their notepaper, visiting cards, business communications, advertisements and so on. If there is any doubt, the correct postal address may be ascertained from the local post office.

2. Addressing letters, postcards, parcels and so on, with the full address given by the person to whom they are writing, including the Post Town, followed for the great majority of places by the name of

the county, and the words *Irish Republic* in the case of correspondence for that country.

3. Typing or writing the address legibly (the Post Town being in BLOCK capitals), in the lower part and towards the right-hand side of the front of the envelope, with a clear margin above (not less than 1½ in. deep) for the postage stamps and postmarks. This margin should extend across the whole width of the correspondence and address panels of a picture postcard.

The Post Office cannot undertake to correct or complete a wrong or an incomplete address.

(f) Prohibitions

Embarrassing Packets

Packets embarrassing to the Post Office staff are also prohibited. Embarrassment may be caused by the method of addressing and the position of the stamp; the colour, type, shape and dimensions of the envelope, packet or card; and by the use of a badly reconditioned envelope which has already passed through the post.

Addresses: A packet having anything printed or otherwise impressed upon or attached to the address side which, either by tending to prevent the easy and quick reading of the address, or by inconvenient proximity to the postage stamps, or in any other way, is likely to impede the officers of the Post Office in dealing with it. Cards, envelopes, folders, labels and wrappers are, however, admitted if the writing or printing is confined to the left-hand of the address side, the right-hand half being reserved exclusively for the postage stamps and the address.

A packet having its address parallel to the breadth instead of to the longer side.

Stamps: A packet bearing on its address side an adhesive label or printed design resembling a postage stamp in shape or size.

A packet having a postage stamp affixed elsewhere than at the right-hand top corner of the address side.

Colour: Red packets or envelopes (except for letters addressed to a renter of a private box for night use and marked specially *Private Box, Night Delivery*), or of any other colour likely to cause strain on the eyes of the officers of the Post Office. Cards, folders, labels or envelopes should preferably be white, but there is no objection to colours (other than red) provided the shades are not too glaring, vivid, dazzling in effect, or too dark; and provided that the dyes used do not contain phosphorescent substances. The ink used for the address must be in sharp contrast to the colour of the paper and the background to the address should be of one colour only. The foregoing also applies to the visible portion of enclosures in envelopes with transparent or cut-out panels.

Envelopes: not conforming to requirements as follows:—

Window envelope: A packet enclosed in a *window* envelope, that is, an envelope with a transparent panel which does not conform to the following conditions:

1. The panel must extend parallel to the length of the envelope;

2. A space of 1½ in. must be left above the panel for the postage stamp and the date-stamp impression;

3. No writing or printing other than the address may be displayed through the panel and the address must appear through the panel in such a manner as to be read easily;

4. The enclosures must be so folded that they cannot move about in the envelope, and thus cause the address to be hidden.

Aperture envelope: A packet enclosed in an *aperture* envelope, that is, an envelope with an open (cut-out) panel which does not conform to the following conditions:

1. The open (cut-out) panel must not exceed 3¾ in. in length by 1¼ in. in breadth;

2. The requirements shown in 1, 2, 3 and 4 in the preceding paragraph headed *Window envelope;*

3. A minimum space of at least ½ in. must be left between the sides and base of the cut-out panel and the respective edges of the envelope.

Transparent envelope: A packet enclosed in a wholly transparent envelope.

"*Trap*" *packets:* A packet having an opening large enough to entrap small letters or postcards. Envelopes with ordinary tuck-in flaps may be used up to the following limits of size:

Not over 4½ in. in depth, unsealed opening not over 6 in. in length,
Over 4½ in. in depth, unsealed opening not over 4½ in. in length.

If a larger envelope is necessary, senders should adopt a pattern having a special kind of flap which can be so adjusted as not to leave a large opening; or the packet can be fastened with string provided that it can be easily untied. If metal paper fasteners are used, they must be blunt and must be well pressed down to obviate risk of injury to the hands of the Post Office staff. Paper clips must not be used.

The maximum dimensions for a folder are 6 in. in length and 3½ in. in breadth.

Dimensions: A card, envelope or folder which is less than 4 in. in length by 2¾ in. in breadth or a packet of such small dimensions as to be likely to impede the officers of the Post Office in dealing with it.

7. Postal Coding

With the ever-increasing volume of mail, both business and private, the task of the G.P.O. is obviously becoming more and more difficult, and the pressure, especially on sorting postmen, is particularly severe. There is also the manpower problem, coupled with the need to keep wages and salaries reasonably in line with industry and commerce yet maintaining the postal service as one of the cheapest and most efficient in the world. The solution to these problems is mechanization.

Although postal mechanization is not the concern of this book, it is appropriate at this juncture, to give some information on Postal Coding and its contribution to mechanical handling. Coding and the standardization of envelope sizes are essential features of an automated postal system.

Automatic Letter Sorting

There is, of course, nothing new about automatic mail handling. In the last ten years, mechanized equipment has made great strides forward and grown increasingly sophisticated and versatile. Today, machines can not only move vast quantities of mail very quickly, they can segregate letters from packets; grade them according to size; stack them ready for facing; turn them round so that all the stamps are in the right position; divert them into streams which divide fully paid items from those sent at lower rates, and then cancel them ready for sorting. At this point however, manual sorting was necessary because until recently machines were not able to read printed or written addresses.

After several years of concentrated research and experiment, post office research engineers in collaboration with machinery manufacturers, developed coding and automatic letter sorting machines. Providing each separate address is translated into "machine language"—a form of code, these machines can carry out primary and secondary sorting; in fact every stage of sorting, right down to the point of street delivery.

Two Part Code System

In the ordinary sorting process, all letters have to pass through two basic stages—OUTWARD and INWARD sorting.

Outward sorting, done in the office of posting, and possibly also in an intermediate office, sorts the letter according to the town to which it is addressed.

Inward sorting, which takes place in the office of destination, sorts the letter in accordance with the street, etc., to which it is addressed, and directs it to the postman who will deliver it.

For mechanized sorting, therefore, the coded address contains two vital pieces of information:—

(1) The name of the town to which the letter is being sent.

(2) The location within that town of the place to which it is to be delivered (house number, street name, and so forth).

The code is in two halves. The first half indicates the town to which a letter is addressed, the second half the actual area of delivery within that town.

In towns of around the same size as Norwich (one of the towns used for operational testing of the equipment), the code will usually be the first three letters of the town—GLO for instance could be used for Gloucester—but where this would lead to difficulty when towns have the same prefix, one of them has to be of a different formula.

In London the first half of the code is the postal district number, *e.g.*, S.W.1, or N.11, and in other towns and cities where such numbers are already in use, the code contains one or two letters to indicate the town, followed by the district number; Leeds 8, for example, may be LS8. Some towns without numbered postal districts are split up for coding purposes, though the district numbers allocated for use in the postal code are not necessarily used in the normal address.

The second half of the code consists of a single figure followed by two letters, *e.g.*, 5BK, which will usually refer to a specific area of the town, a small street for instance, or part of a street. Large individual users of the post will have their own codes.

Introduction of Codes

Codes will first be allocated to London and some of the larger towns and cities. They will be announced as soon as each separate coding study is completed. Everyone living or working in the area in question, will be told what their particular code is and asked to quote it in future as part of their normal address on letter headings. In this way people will get to know other people's address codes and will be able to add them to the postal address on envelopes.

Code lists for each town will be published and also included in telephone directories and other publications. This will be done systematically, town by town, until the major part of the programme is completed somewhere around 1970. By that time, offices which handle about three-quarters of the nation's mail will be covered by coding schemes, and postal codes will have become a normal part of a postal address in the same way that District numbers have come to be accepted.

Coded Sorting

Letters that have automatically been separated from packets, faced, had their stamps cancelled and are ready for primary sorting, are taken to a coding desk and fed automatically to a human operator one at a time. The operator reads the code on each letter, and copies it on a keyboard similar to that of a typewirter. This prints two lines of phosphorescent dots on the envelope, one above and one below the address. The lower line corresponds to the outward half of the code, and the upper line the inward half. These phosphorescent dots—which glow on exposure to ultra-violet light—express the code so that it can be "machine read".

Coded letters are then fed to a sorting machine which reads the outward half of the code and sorts the letters to selections appropriate to the towns to which they are addressed.

When the letters arrive at the office of destination, they are again mechanically sorted. This time the machine reads the upper row of dots—the inward half of the code—and sorts for the appropriate delivery postman.

In effect therefore, once a fully coded letter has passed through a coding desk, it can be sorted automatically at (*a*) the office of posting, (*b*) the office of destination, (*c*) any intermediate office through which it may pass, without the address needing to be read again by the human eye, until the letter reaches the postman for delivery.

The general principle on which the sorting machine operates is as follows. Letters are placed in the input stack of the machine, and then carried one at a time past a source of ultra-violet light which causes the phosphorescent dots to glow. The dots are then scanned by a reading device which reports what it has read to a "translator"—an electronic "memory" in which all possible sorting plans for the machine are recorded—and the translator then "tells" the machine into which selection it must put the letter.

A single translator can serve many sorting machines at the same time and all machines can be used for either inward or outward sorting. It can also sort to a number of different plans. Details of all the sorting plans required in an office, are recorded in the translator at that office, and machines can be switched over quite simply from one plan to another.

Uncoded letters will be dealt with by a simple procedure, but this special handling will take longer than the treatment of coded items.

Automatic coding and sorting machinery will be brought into use in offices a year or two after the introduction of postal codes in that area. By that time people will be familiar with the codes and have got into the habit of using them regularly.

Future years will almost certainly bring further technological changes of which the most important, and the most likely, may well be the development of machines that can actually read written addresses. Such a development however, is not likely to effect the validity of the present system since it will probably still be easier for the machines to read and sort from codes, than to deal with the full address.

8. Packaging Envelopes

Envelope production and availability has so far been dealt with in terms of general use for document enclosure etc. Equally important are those made for special purposes, particularly in the field of packaging. Strictly they are really a sub-division of packaging supplies and materials which consist of a large and varied range, including items made from materials other than paper and board. However, since the wider aspect of packaging is not dealt with in this volume, packaging envelopes are included here firstly for convenience and secondly because they are closely allied to general envelope manufacture.

The use of envelopes for packaging purposes is complementary to paper bags which are dealt with in the next section. Although in some cases demarcation between the two is difficult, in general terms, packaging envelopes are of pocket or banker style and are further distinguished from paper bags by the provision of an unserrated sealing flap.

Paper Qualities and Use

Almost all qualities of paper are suitable and they include manillas, sulphites, krafts, cartridges, cream woves and laids, parchments, glazed transparents, glassines, coated and impregnated papers, all in a variety of substances.

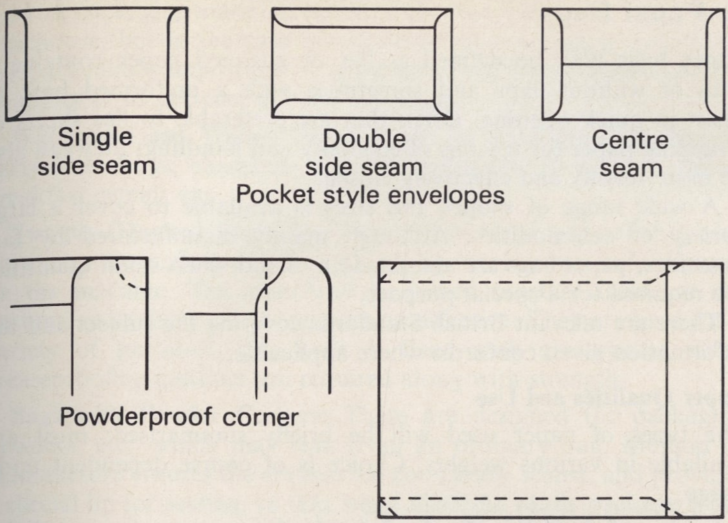
It must be stressed, however, that the choice of material in relation to the product to be packaged is of the utmost importance. For example food stuffs, certain photographic products, certain metal parts, require the material to be either non-toxic, opaque, or moisture repellent etc. In the case of certain medical products, the material must be capable of withstanding sterilization processes.

Typical uses include the packaging of food powders, medicinal powders and tablets, photographic products, small parts for all industries, seeds and bulbs of all types etc.

Styles and Shapes

The most commonly used styles are pocket, banker and gusset as already described in a previous section. In the case of pocket style the seams may be single or double sided, or in the centre. In the case of envelopes made for packaging powders, a sift-proof seal is required and this is provided by constructing the envelope so that its four corners fold over on themselves.

The gusset style is useful for many kinds of bulky articles and the easy mailing of samples. Where additional protection is necessary, as in the case of photographs, calendars, showcards, etc., board backed envelopes are the most suitable. Solid end pockets allow for stamp cancellation without risk to the contents when sent through the post.



Seams and corners of packaging envelopes

Sizes and Measurements

Although some types of packaging envelopes are stock lines with certain manufacturers, most are made to order. As the dimensions are dependent upon the contents, there is no standard size range. To achieve economy in production however, it is advisable to conform wherever possible to one of the standard sizes appertaining to envelopes generally, which have already been detailed.

The length and breadth of the envelope is stated also as for general envelopes according to whether they are pocket or banker style, *i.e.*, the first measurement is that which is at right angles to the opening.

Sealing

The sealing or closure of packaging envelopes is usually effected by gum or latex coated flaps, various tuck flap styles, metal fasteners, string and washer, and heat sealing. Whilst in some instances filling and sealing is carried out by hand, automatic machinery is widely used and it should be determined whether the particular closure can be effected automatically.

Printing

Usual methods of printing can be employed and requirements vary from simple instructions in one colour, to multi-colour descriptive and advertising matter. The choice of process will largely depend on length of run, printed matter and colours. Particular care must be taken with some goods as statutory requirements may require some special wording.

9. Paper Bags

Paper bags may be defined as flat or gusseted paper containers, with or without flaps and sometimes with a preformed base to assist in quick opening. Often they are preferable to flat sheets of wrapping paper for reasons of economy and handling; they can also be more readily and effectively closed.

A wide range of shapes and sizes is available to cover a large variety of commodities. Although mainly manufactured by fast machines, paper bags are also made by hand when small quantities are required for a special purpose.

There are relevant British Standards covering the subject and the information given conforms where applicable.

Paper Qualities and Use

The types of paper used will be briefly summarised; most are available in various weights. Choice is of course dependent upon usage.

Kraft and Imitation Kraft: Suitable for counter bags and for packaging fruit, food, small parts and accessories, and similar articles. The heavier substances are suitable for larger parts and accessories and bulky but light materials. Kraft is also used in the manufacture of duplex (two-ply bags) *i.e.*, the outer ply, with greaseproof or similar lining for coffee, drugs, etc.

M.G. Sulphite: These bags are principally recommended where low cost and not strength is the first consideration. They are generally used for protection in the packaging of single or composite units. Uses include the packaging of small quantities of food, counter bags, and as an outer covering for goods already wrapped in protective materials.

Greaseproof: This is used for packaging anything of a greasy nature.

Vegetable Parchment: Used for packaging of butter, lard, etc. as well as foods in powdered form.

Glazed Transparent (Glassine) : This material has two principal characteristics; it is resistant to grease and it is partially transparent. It is therefore used for packing foods, particularly snacks, but also for garments, laundered articles, soft goods, etc. Vast numbers of this type of bag are used as wage bags (with gummed flaps). The photographic and philatic trades also use bags made from this material extensively.

Cellulose Film, Polythene, etc.: These materials are used in the packaging of cigarettes, tobacco, confectionery, baked goods, groceries, meat, vegetables, pharmaceutical products, stockings, textiles, etc.

Most packaging materials benefit from being stored in a dry, cool, warehouse, but in the case of cellulose film, the storage conditions are particularly important. A temperature of 55° F. and a relative humidity of 65 per cent are recommended.

Waterproof and Waxed Paper: Used for packaging engineering parts, fine drugs, chemicals, biscuits, powdered food, soap flakes, breakfast cereals etc.

Two-ply (Duplex) Bags: Any two papers (or 2 plies of the same paper) can be made into a two-ply bag by running two reels of paper on the machine. The plies may be joined together inside at the bottom, or at the seam or top with an adhesive. They are used for a variety of purposes, *i.e.*, kraft is lined with greaseproof when greaseproofing qualities are required along with strength.

Bags with Powder Corners: These are designed for packaging powders, etc., which may leak from an ordinary bag. Method of manufacture ensures the corners are completely sealed, and provides a special lip for sealing, so that when filled the whole package is sift proof.

Special bags: These may be made by hand or machine for a variety of special purposes. Examples are those made for saddles and mudguards for cycles and motor cycles, hardware articles, cash bags, laundry bags, etc.

Sizes, Measurements, Styles and Shapes

As already indicated, paper bags are made in a wide range of sizes and in addition, there are a number of different styles and shapes. Since the choice of any one is so much dependent upon use and requirement, no attempt is made to detail all that are available. Reference to manufacturers literature will provide such information and the appropriate British Standard. More important is the method adopted for indicating the size, together with the correct designation of style.

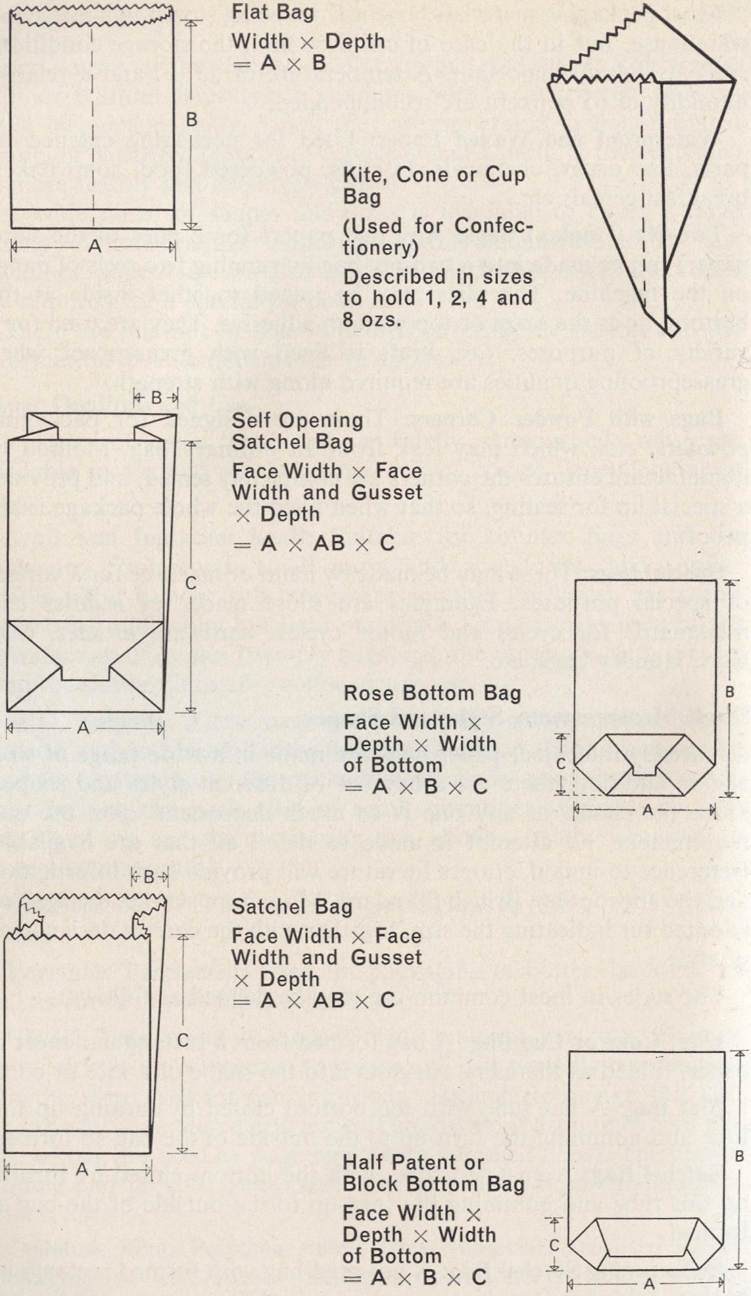
The styles in most common use may be defined as follows:—

Kite, Cone or Cup Bag: A bag formed from a rectangular sheet of paper, folded as the name suggests into the shape of a kite or cone.

Flat Bag: A flat tube with the bottom closed by turning up this tube and gumming the turn-up to the outside of the bag so formed.

Satchel Bag: A gusseted tube, with the bottom closed by turning up this tube and gumming the turn-up to the outside of the bag so formed.

Self-opening Satchel Bag: A gusseted bag with formed rectangular bottom folded fla tagainst one plain side. Filling opens out the bag into a rectangular shape without any further creasing being needed.



Flat Bag
Width × Depth
= A × B

Kite, Cone or Cup Bag
(Used for Confectionery)
Described in sizes to hold 1, 2, 4 and 8 ozs.

Self Opening Satchel Bag
Face Width × Face Width and Gusset × Depth
= A × AB × C

Rose Bottom Bag
Face Width × Depth × Width of Bottom
= A × B × C

Satchel Bag
Face Width × Face Width and Gusset × Depth
= A × AB × C

Half Patent or Block Bottom Bag
Face Width × Depth × Width of Bottom
= A × B × C

Paper bag shapes and method of size designation

Block Bottom Bag: A bag made with a lengthwise lap joint, creased each side to fold flat, with the bottom made by first folding into a flat diamond shape, then folding over the points to meet in the centre. This gives a bat opening out into a square cross-section.

Rose Bottom Bag: A block bottom bag, with a small tag uniting the abutting points of the folded bottom. The open bag has a rectangular cross-section.

Sealing

The sealing or closure of bags may be effected by folding, tucking or twisting the surplus length of bag not in use; gummed or adhesive tapes or seal; adhesives; latex when sealing without moisture is required; ties or stapling; stitching; crimping; heat sealing.

In respect of heat sealing, various compounds used require different temperatures for effective sealing. The appropriate temperature in such cases should be obtained from the manufacturer.

Printing

Consumer directions, instructions, advertising matter can be printed to requirement. When printed after manufacture the process is usually Letterpress. The most common method, however, is to print at the time of manufacture from the reel by the Flexographic process. This is capable of producing some very bright and colourful results with the range of aniline and waterbased inks available. Where a photographic result is required Photogravure is employed, but this is not economical for short runs.

Printing on the reel is very different from printing in the flat sheet and wherever possible the final artwork should be prepared by the bagmaker or under his close supervision.

Manufacturers offer a stock range of printed designs, which can be overprinted with name and address, or they can offer stock blocks which can be incorporated with the customers printed matter.

In conclusion, the use of the correct material and weight, together with other specifications, cannot be too highly stressed. This is particularly so in the case of cellulose films, polythene etc. Where special ordering is necessary, it is advisable to consult the manufacturer at an early stage.

10. Paper Carrier Bags

As the name implies, this type of bag enables goods to be carried conveniently, as well as providing a speedy wrapping service. They can be made in various styles, for a variety of products, and are consequently used by most retail shops and stores.

Paper Qualities and Use

Most carriers are made from M.G. Pure Kraft, in substances varying from Double Crown 20 lbs to 44 lbs, dependent upon the size, type, and weight of goods they are intended to carry. In terms of usage they may be conveniently classified into two main types.

Fashion Carriers: These are produced in a wide range of sizes and in flat, satchel sided, and gusset bottom styles. Smaller sizes are normally used for such goods as gloves, hosiery, baby wear, children's wear, lingerie, blouses, knitwear, shirts, pyjamas, shoes, gramophone records, etc. Larger sizes are more suitable for dresses, coats, costumes, suits, rainwear etc.

Provision Carriers: These are suitable for all types of provisions and food products, as well as many other uses, including those for the carrying of bottles of wine, beer, soft drinks, etc. Although suitable for many trades, the largest single users are undoubtedly the self-service shops and super markets.

The block bottom flat carrier bag is supplied with the traditional cord carrying handle or twisted kraft handles, whilst the block bottom gusset side style are provided with either flat paper or twisted kraft handles.

Sizes, Measurements, Styles and Shapes

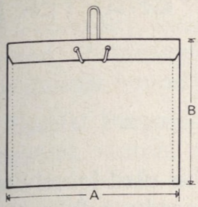
The vast majority of carriers are made specially in sizes to suit the commodity they are intended for and consequently the correct size, description, is of major importance. The most commonly used styles and shapes, together with the method of expressing the size are as illustrated.

Printing

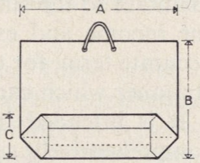
Carrier bags are printed mainly by the flexographic process and demand is for bright and colourful designs. Photogravure is also employed, but basically only in the smaller sizes, or for all over repetitive background designs. Large quantities are printed from the reel.

Small quantities are printed after manufacture. Consequently consideration must be given to the amount of printed matter and layout. This is necessary to avoid printing over the extra thickness of paper due to the block bottom which is folded over on to the bag, as this affects the printing impression.

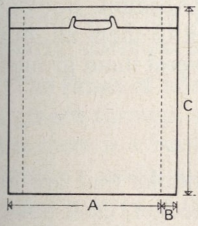
Manufacturers normally offer a range of stock designs which can be incorporated with the customer's name and address to overprint as an attractive setting. Larger users naturally tend to have their own particular design.



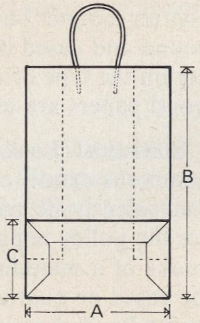
Flat Carriers
Width × Depth
(A × B)



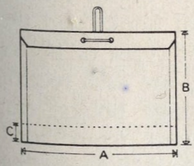
Block Bottom Carriers
Width of Face ×
Depth × Width of
Block Bottom
= A × B × C



Satchel Sided Carriers
Face Width × Face
Width and Gusset
× Depth
(A × AB × C)



S.O.S. Carriers
Width of Face ×
Depth × Width of
Block Bottom
= A × B × C



Gusset Bottom Carriers
Face Width × Depth
× Width of Gusset
= (A × B × C)

Carrier bag shapes and method of size designation

CHAPTER 8

Account, Commercial and Educational Books

In the stationery trade the term "account books" is used loosely to describe all those bound books in which records are kept, from the books which a limited company is required by Act of Parliament to maintain to the simple book in which the local scoutmaster records the income and expenditure of his troop. But it is not a strictly accurate term, for there are many books made by the manufacturing stationer which cannot properly be described as account books.

It is intended in this chapter to deal with this wide range as comprehensively as possible: that is why the title "Account, Commercial and Educational Books" has been chosen rather than the more usual, though more restrictive, one of "Account Books." Nevertheless, it will be impossible to refer in detail to them all, but, broadly speaking, they may be subdivided into several main groups.

1. Types of Books and Papers

Books of Account: These comprise all financial books that are an integral part of a system of book-keeping—*e.g.*, ledger, cash book, purchase book, sales book, journal, analysis, etc. The majority of the books in this group are half bound, although cased and quarter bound books are also used. The body paper in the half bound and cased books is usually a ledger paper, its quality depending on the type of book. In the quarter bound, esparto and chemical wood papers are used.

Statistical Books: These are books in which are entered the numerous details connected with business operations which cannot conveniently be recorded in the financial books. Examples of them are the policy register of an insurance company, the cost and stock books of a manufacturing firm, bill books, etc. They are usually of the cased or quarter bound type, using ledger paper, although both esparto and chemical wood papers are also used.

Subsidiary Commercial Books: These include all books related to a book-keeping system other than the principal books and the books of prime or original entry, as well as other types of books connected with commercial transactions. Examples are cash receipt books, rent books, trademen's pass books, postage books, etc. Within this group most types of bindings are used, from cased bindings to simple wire stabbing, and paper content varies according to the type and purpose of the book.

Minute Books: These record the proceedings of meetings, whether of a company, association or club. In the main they are half or full bound, containing ledger type paper, although it is not uncommon for quarter bound books containing esparto paper to be used.

Special Purpose Books: These are such books as appointments registers, visitors' books, surveyors' books, drivers' log books as well as specially ruled and printed books which do not come within one of the other categories which have been mentioned. In this range of books will be found all types of bindings, including full, half and quarter bound. The paper will vary according to the make-up and general purpose of the book.

Memorandum, Exercise and Manuscript Books: These cover a wide and most popular range of books produced for commercial and educational use. They are made available in different types of bindings—*i.e.*, sewn, thermoplastic, spiral and stitched. The covers may be limp, semi-stiff or stiff according to the type of book and various covering materials used. Grades of paper used include esparto, chemical and mechanical wood.

The range of books in each of the above divisions is considerable. A glance through several manufacturers' catalogues will soon show that there is a book for almost every purpose one can think of. It is therefore essential that the assistant should be aware of what is available even if it is not stocked by his company. There is also a considerable demand for specially made books, and a complete understanding of what is involved will go a long way towards ensuring satisfaction to the customer in a speedy and efficient manner.

2. Methods of Ruling

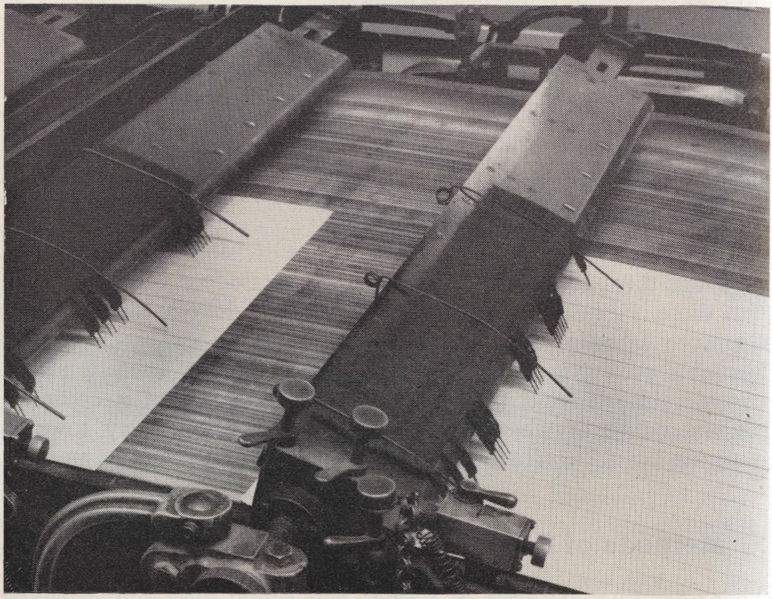
There are four methods of ruling: pen ruling, disc ruling, ruling from engraved rubber rollers, and ruling by the lithographic and letterpress printing processes; each is done on a different type of machine.

Pen Ruling

This is effected by means of specially made pens on a flat-bed machine. These pens, which are flattened brass, provided with a narrow channel through which the ink is conveyed to the point, operate from a frame attached to a carriage known as the "striker beam," which is mounted across the bed of the machine. They are fed by wool and flannel saturated with ink of the necessary colour and laid across them. The sheets to be ruled are carried on an endless blanket under the beam so as to allow the pen points to touch the paper.

Although the process is known as machine ruling, a considerable portion of the management is under the control of the operator, and it is his skill which ensures satisfactory ruling.

Pen ruling is employed for best-class work, "specials" and intricate patterns, and it is the most satisfactory method of ruling hard-surfaced papers. Occasionally it is somewhat difficult to get the ink to lie on a hard-surfaced paper, especially if it is inclined to be greasy, but the use of a little gall may help to overcome this trouble. This method only allows one side of the sheet to be ruled at a time.



Pen Ruling.

Disc Ruling

Whereas pen ruling is done on a flat-bed machine, disc ruling is performed on the rotary principle and both sides of the paper can be ruled at the same time. The actual ruling of the lines is effected by small metal discs, set up on spindles to the gauge of ruling required, with the necessary spaces between.

The spindles are then placed in the ruling machine, one for the top side of the sheet and one for the underside. The discs turn as the paper passes beneath them and receive their ruling ink from a rubber roller fed by means of a flannel which, by capillary action, soaks up ink from the trough in which it lies, and moistens the rubber roller with which it is in contact.

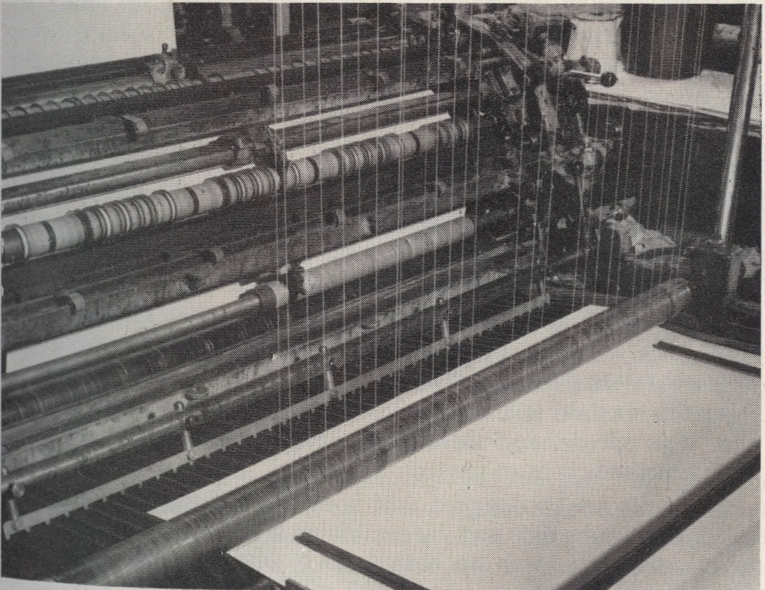
Even when the patterns are not alike, it is possible to rule both sides of the sheet at one working—*i.e.*, the paper does not need to be taken off the machine for the reverse side to be ruled as in the case of pen ruling.

Furthermore, if two disc ruling machines are placed adjacent to one another but at right angles, it is possible to rule horizontal and vertical lines on both pages and both sides of a sheet without lifting the paper, provided that the paper is transferred from the first to the second machine by an automatic conveyor in the shape of an L.

With a little careful observation it is possible to distinguish between this method and that of pen ruling. In the case of disc ruling, the vertical lines will sometimes appear a little heavier at the headline if the ruling has been from the head of the sheet; this is caused by the action of the discs coming down on the paper. In addition, the lines are somewhat sharper; occasionally the impression of the discs is sufficiently heavy to be noticeable on the reverse side of the sheet; and in many instances, when the discs have become worn, the lines will be broken.

This latter feature is also to be found in books which have been pen-ruled, but here it is due to the over-sizing of the paper, and it is more frequently noticed on hand-made papers.

In a well and carefully ruled book all the joints or junctions of the vertical lines with the horizontal headlines should be clean, and the



Disc Ruling.

ruling should not overrun or stop short; furthermore, there should be no merging of the colours of the feint and vertical lines.

It should be noted that the double red lines which bound a box-heading horizontally give the ruler three times the space in which to stop or start the vertical lines than would a single line, so that when alterations are under discussion it is worth while resisting any proposal to reduce one of the "doubles" to a "single."

Register is very important in duplicate or triplicate books where columns of figures have to be correctly copied on to one or more sheets; if the register is not true, figures will be found in the wrong columns, with at least annoying, and perhaps serious, consequences. The ruling in this particular stock requires the most careful examination.

Should the register not be true, however, it is not necessarily the fault of the ruler, unless he has failed to see that all the sheets were cut precisely the same size and contained at least one right angle. A cutter, or folder, who disregards the "lay" edges which the ruler has marked may easily nullify the best efforts of any ruler, and throw the register right out.

Care must always be taken when ruling paper to make sure that the ruling is correct relative to the machine direction of the paper; in a sewn section book, for instance, the grain should run from head to tail to allow the paper to stretch across the width of the book and so avoid cockling.

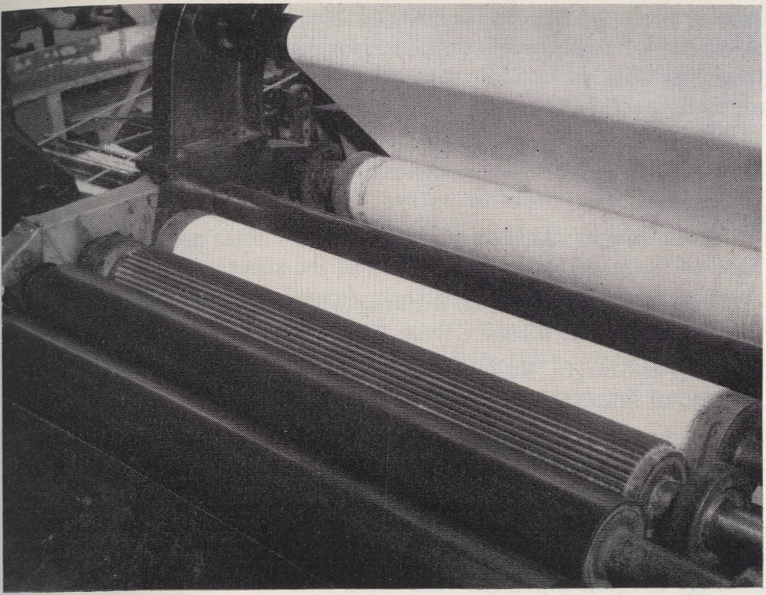
Engraved Rollers

This is a fully-rotary method, using rubber rollers which have been engraved lengthwise to the appropriate ruling. The method of application, which is identical to the flexigraphic printing process, involves a roller rotating in a bath of ink, with another roller to remove excess ink, which is itself in contact with the engraved rubber pattern.

An impression is made on the paper as it passes between the engraved roller and a plain rubber or steel roller known as the "bed." By adjusting these two rollers to the correct pressure an accurate ruling may be obtained.

As this method is a continuous process it is able to produce at very high speeds, and therefore adapts itself admirably to fully-rotary methods of working from the reel.

The units are so designed that both sides of the paper may be ruled at the same time and, by combining several units, it is possible to rule two reels each on both sides in one operation. Ancillary disc units can be incorporated which will enable "down" lines to be ruled in a second colour if necessary.



Engraved Rollers.

Lithography—Letterpress

In many cases where accuracy is all important some patterns are now printed instead of ruled, mainly on lithographic printing machines but sometimes on letterpress printing machines. This would cover such papers as graph and also special books with printed headings—*e.g.*, special appointments books such as are used by dentists, and many other types. The processes are fully explained in the chapter on printing.

3. Rulings

Styles

Mistakes are likely to occur when stock books are being ordered if the various trade terms applied to ruling patterns are not properly understood. When a standard ruling has to be indicated it is generally sufficient to give the recognized term, but in the case of special rulings it is essential to have a draft of the pattern.

"**Feint (Ft.)**" is the term which indicates the pale blue, grey, or green horizontal lines which run across the breadth of an account or other ruled book or paper. In some cases these lines are termed "common feints," and, if the term is strictly applied to account book rulings, it denotes that the lines are a certain distance apart (about one-third of an inch); but when it is applied to foolscap sheets (loose) it means there are normally 34 lines to the page; in bound books with head-line it is usually 31 or 32 feint lines; while "narrow feint" signifies 46 to 52 lines to the page, or lines about a quarter of an inch apart.

"**Guide Lines**." Some manufacturers rule every fifth feint line a little heavier—particularly in analysis rulings—to assist in quick reference or location of an entry.

"**Run-through**." This term means that the lines are ruled from the head of the page to the foot or tail of the sheet.

"**Stop-at-Head**" refers to a ruling where vertical lines drop from a head-line a little distance from the head of the sheet or page.

"**Stop-at-Margin Ruling**" is that class of ruling in which the horizontal lines stop at a vertical margin line.

"**Box-head**" is the term applied when the ruling consists of two head-lines, usually of greater distance apart than the normal feints with the down lines originating from either of them, thus forming a box at the top of the column for the insertion of a printed or written heading. Box headings may also be "split," or divided laterally, by a single or even a printed rule when it is necessary to give two or more columns a common overall title.

"**Single Date**" is a single vertical column ruled on the left-hand side of the pattern.

"**Double Date**" signifies two vertical columns, one of which divides the month from the day. It is the usual pattern for foolscap and larger sizes. In sizes such as quarto or octavo the "single date" is more usual, but frequently the "double date" is employed.

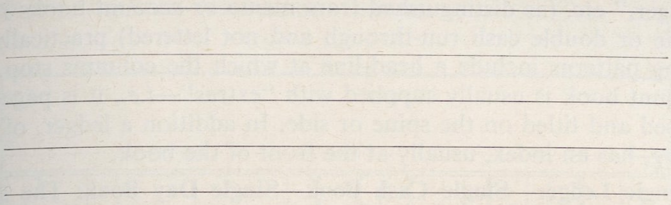
"**Folio Column**." This is a single column ruled before the cash column or columns.

Run-Through Rulings

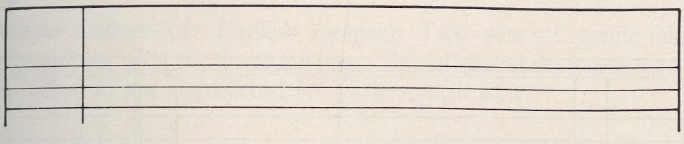
The following descriptions cover the standard rulings in general use. Vertical lines in ruling are generally described as "columns" and will be so mentioned here after the third item.

Feint Only (common): Blue, grey, or green horizontal lines only (foolscap broad folio usually 34 lines, or approximately 3 spaces to the inch).

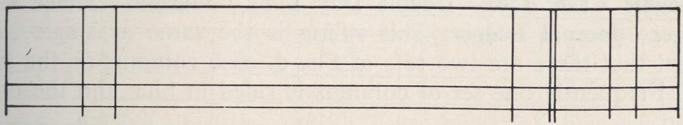
Narrow Feint: As above, but the feints are closer together (foolscap broad folio 46 to 52 lines, or approximately 4 spaces to the inch).



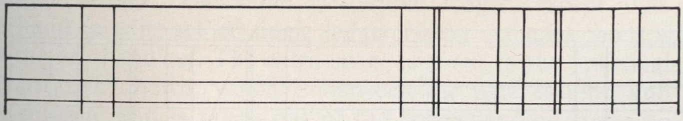
Feint and Margin also known as **Minute Book Ruling:** Blue, grey, or green horizontal lines only, with a vertical line down the left-hand side (in foolscap broad folio generally 1½ in. from the left edge).



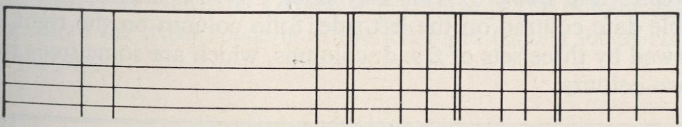
Feint and Single Cash: Double date column on the left side. Folio column and single set of £ s. d. columns on the right side.



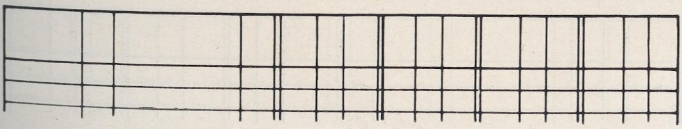
Feint and Double Cash: Double date column on the left side. Folio column and two sets of £ s. d. columns on the right side.



Feint and Treble Cash: Double date column on the left side. Folio column and three sets of £ s. d. columns on the right side.



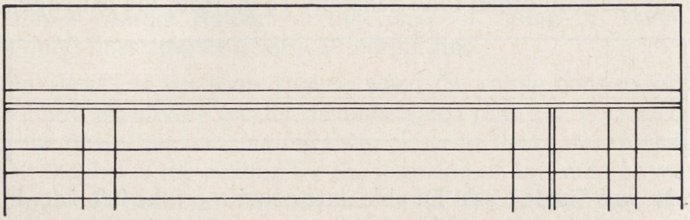
Feint and Quad Cash: Double date column on the left side. Folio column and four sets of £ s. d. columns on the right side.



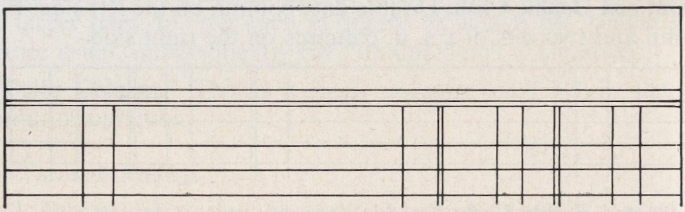
Account Book Rulings

In account books which are made up and titled "day book," "ledger," etc. (as distinguished from memo or account books ruled single or double cash run-through and not lettered) practically all ruling patterns include a head-line at which the columns stop. An account book is usually supplied with "extras"—*i.e.*, it is paged or folioed and titled on the spine or side. In addition a ledger, of any ruling, has an index, usually at the front of the book.

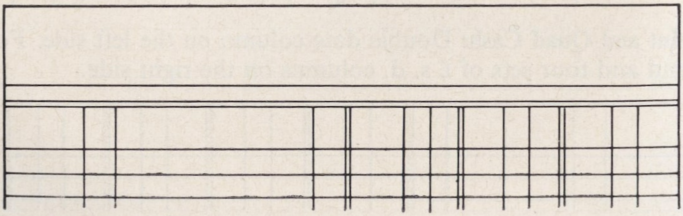
Single Ledger—Single Cash Book—Single Day Book: The same ruling applies—*viz.*, head-line, double date column on the left, folio and single set of £ s. d. columns on the right.



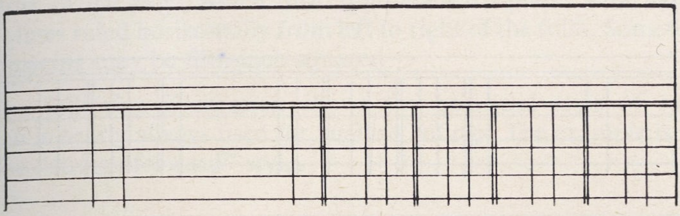
Double Cash Book—Double Day Book—Journal—Double Cash Ledger—Journal Ledger: This ruling is the same as single cash, except that there are two sets of £ s. d. cash columns on the right side. Frequently one set of columns is ruled in blue and the other in red.



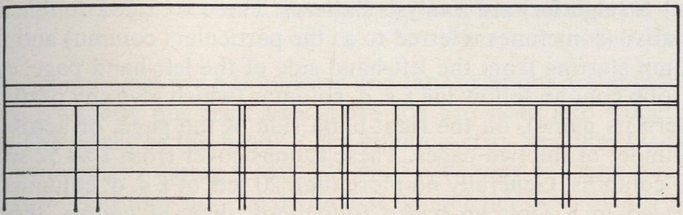
Treble Cash Book—Treble Day Book—Treble Ledger: Head-line, double date column on the left side, folio column on the right side followed by three sets of £ s. d. columns, which are sometimes ruled in two colours.



Quad Cash Book: Head-line, double date column on left side, folio column on right side followed by four sets of £ s. d. columns which are sometimes ruled in two colours.

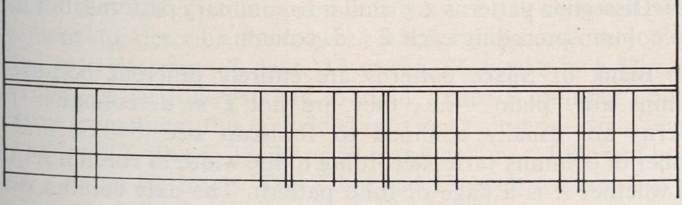


Double Ledger (or **English Ledger**): Two sets of single ledger rulings side by side on the same page, the left-hand set known as the debit side and the right-hand set as the credit side.

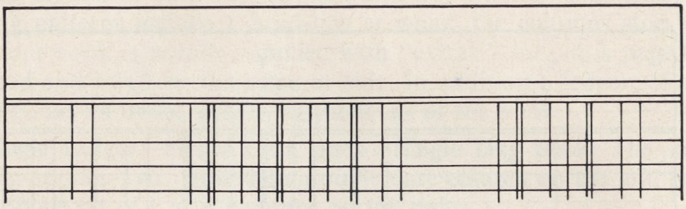


Bought Ledger: The same as double ledger, except that the right-hand (credit) set of single ledger ruling occupies more width than the left-hand set. The extra space is given to the "particulars" or "narrative" space, which is between the date column and the folio column, and is taken out of the corresponding space on the left-hand (debit) side. (Not illustrated).

Sold Ledger or **Nettleton Ledger:** The reverse of the bought ledger ruling. Here the extra space is in the left-hand (debit) set of ruling (see diagram).



Double Cash—Double Ledger: Instead of the single ledger ruling being produced twice on the same page, the journal or double cash ruling is used in the same way.



Analysis Book Rulings

These are too numerous to be tabulated in detail, for every conceivable useful analysis ruling is now stocked by many manufacturers, from any one of whom a list may be obtained. Nevertheless, the following general remarks may serve as a guide to these rulings.

(a) **Straightforward Analysis Patterns:** These are ruled double date, narrative (sometimes referred to as the particulars column) and folio column starting from the left-hand side of the left-hand page. After the folio column follow the £ s. d. columns (which give any particular pattern its name), on the right-hand side of the page, or across the remainder of the two pages. These rulings cover from 1 to 52 sets of cash columns. Generally no more than 20 sets of £ s. d. columns can be ruled in a foolscap broad folio book, but, of course, the size may be enlarged to accommodate a larger number of columns.

(b) **Petty Cash** analysis patterns are more complicated. The distinguishing feature of these is the debit column or columns on the left-hand side separated from the credit side columns by double date, particulars or narrative, and folio columns. Space limitations prevent any attempt to describe all petty cash patterns that are stocked. Broadly speaking, however, it may be assumed that these patterns include combinations of from one to nine debit columns with from seven to 25 credit columns.

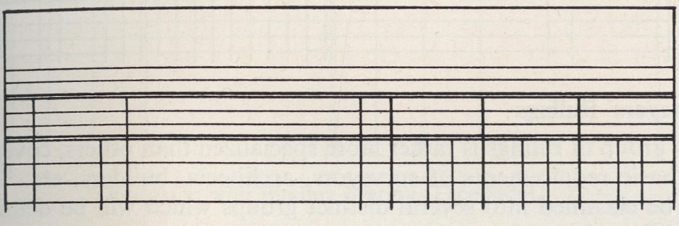
(c) **Summary** patterns are easily described. These patterns simply consist of cash columns ruled across the folio, without date, narrative or folio columns.

(d) **Dissection** patterns are similar to summary patterns, but have a folio column preceding each £ s. d. column.

(e) **Blank** or **Space** patterns are entirely different because the columns are "plain"—*i.e.*, they are not £ s. d. columns. These patterns are usually confined to foolscap size books, and the number of columns varies according to the width of column required and whether it is a page or folio pattern. The date column on the left side may be single or double, and it is followed by a narrative column, but there is no folio column.

(f) **Quadrille Patterns** are often included in the analysis book range. This pattern is formed by ruling narrow feints, from top to bottom of the page, which form quarter-inch squares with narrow feint lines ruled horizontally from left to right of the folio. Sometimes the spacing may be fifth-inch squares.

The following illustration shows the box-head style of ruling which is nearly always used for analysis rulings. The example is also of the "straightforward" style.



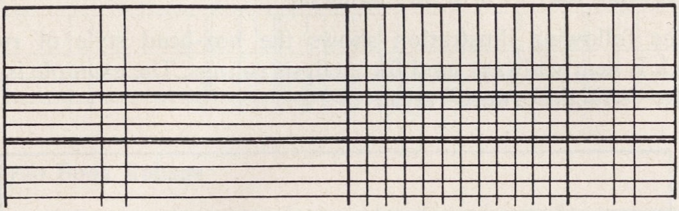
Horizontal lines are not uniform and the variations are numerous. There is usually one feint line above the box-head and sometimes two. The boxes at the head of the columns may be quite blank or have two feints running through them. Feints may be "common" or "narrow" and they may be divided at regular intervals by a slightly heavier feint, which helps the clerk's eye to follow accurately across a maze of lines. Often the penultimate feint is ruled in red to form the top ruling of a "total," since so many of these analysis books are totalled at the foot of each page.

Because of the number of columns in these analysis patterns, alternate columns are often ruled red and blue, which helps to distinguish the different sets of £ s. d. columns; in the case of petty cash rulings the debit columns can be ruled in blue and the credit columns in red unless there are more than two debit columns or several credit columns, when the alternate red and blue system is followed. The colouring, however, varies from manufacturer to manufacturer.

(g) "**Collectors**" or "**Club**" **Books** are not strictly analysis books, but since they are often included in analysis book ranges it will be convenient to describe them here. Stock rulings are very clearly divided into patterns—7 days, 13 weeks, 26 weeks and 52 weeks. The ruling is as follows: left to right, date or number column, narrative (sometimes this is divided into two columns—*viz.*, "name" and "address"), then 7, 13, 26 or 52 blank columns, followed by one £ s. d. column for totals. The 7-day and 13-week patterns are page patterns, the 26 and 52 weeks are folio patterns. Feints are usually "common"; there is a head-line, but the vertical lines are "run off" at head and tail.

Another ruling sometimes found in this range is 31 columns suitable for daily entries to cover a month across the opening.

The following example is a 13-week ruling.



Surveyors' Rulings

This group of rulings is rather more specialized than others, covering the basic requirements of surveyors, architects, builders, etc. They can be classified into several distinct groups which will be detailed. Qualities of papers used are azure laids or woves, cream laids or woves, bonds and banks, dependent on use and customers' requirements. The lighter weights are for typewriter use, while the others are for manuscript work. The ruling may be one side or both sides. In addition to those detailed, others are ruled to specific requirements of the individual.

A B.S.I. standard is available for dimension and quantity papers, and the A4. size is also coming into use.

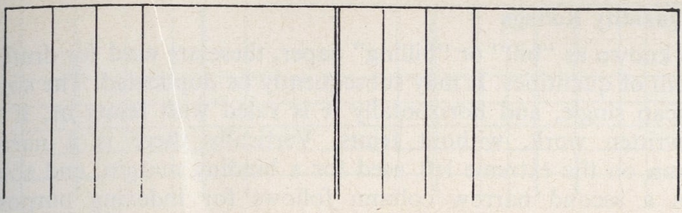
(a) Dimension Ruling

This is usually foolscap single sheets. The page is divided in half vertically by a double line, and each half has three columns on the left-hand side, approximately $\frac{1}{2}$ in. to $\frac{3}{4}$ in. wide, and no feint lines. It is used for entering measurements taken from drawings, calculations derived therefrom, and a description of the item measured. Sometimes a binding margin is incorporated to enable the sheets to be bound.

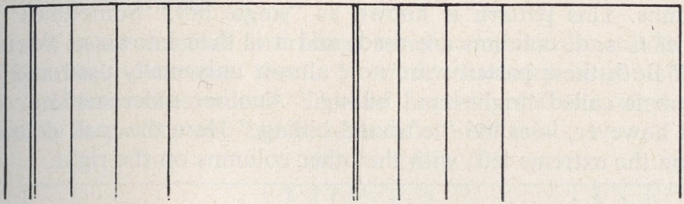
A variation is known as "cut and shuffle" dimension paper. Here the paper is used in the oblong way and thus the pattern is produced four times instead of twice. Frequently each pattern is perforated for detaching.

(b) Abstract Rulings

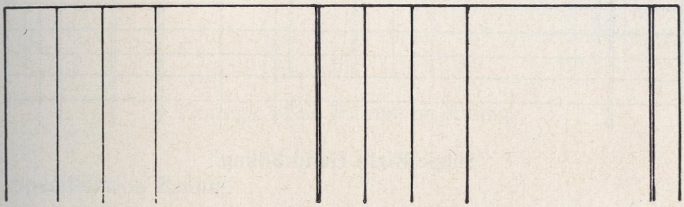
These papers are usually foolscap fly. Horizontally the ruling consists of a head-line or box-heading, with or without feints. Vertical lines are ruled to give about 12 to 16 plain columns. They are used for "abstracting" figures and dimensions from the completed



Dimension without Binding Margin.

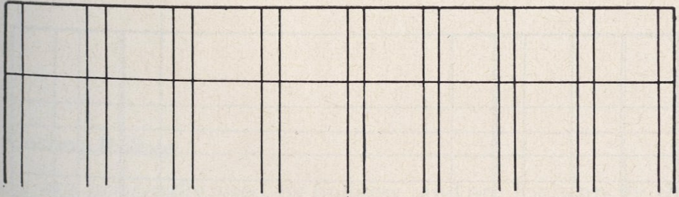


Dimension with Binding Margin (Face Side).



Dimension with Binding Margin (Reverse Side).

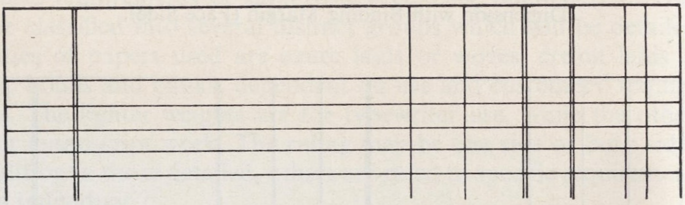
dimension paper. A variation is to include a narrow column between every two wide columns, which is used to index the page number of the dimension sheet from which the figures in the wide column have been abstracted.



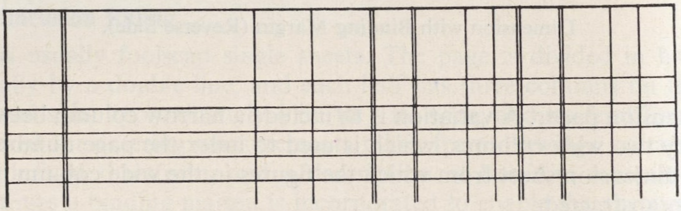
Example of Abstract Ruling (showing Half the Folio Pattern of 16 columns, each with Narrow Column, Headline and No Feints).

(c) Quantity Rulings

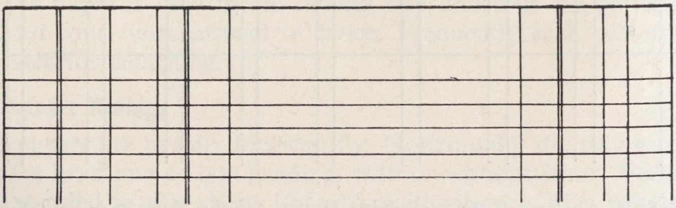
Also known as "bill" or "billing" paper, these are used for drafting the bill of quantities. It may subsequently be duplicated. The size is foolscap single, and horizontally it is ruled with feints or, if for typewritten work, without feints. Vertically there is a narrow column on the extreme left used for a binding margin, and sometimes a second narrow column follows for indexing purposes. Then comes a wide description column followed by three narrower columns—one for quantities, one for units of measurements, and the third for rates. The pattern is completed with a set of £ s. d. columns. This pattern is known as "single bill." Sometimes two sets of £. s. d. columns are used, and it is then known as "double bill." Both these patterns are now almost universally used and the system is called "right-hand billing." Another older method, still used however, is called "left-hand billing." Here the cash columns are on the extreme left, with the other columns on the right.



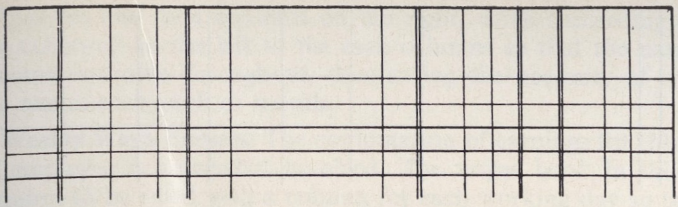
Single Right Hand Billing.



Double Right Hand Billing.



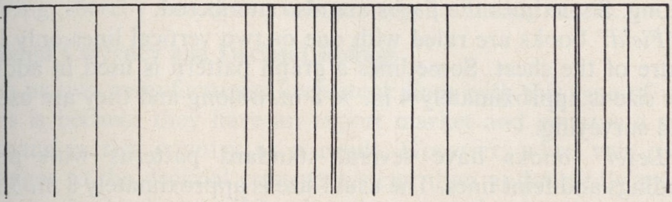
Single Left Hand Billing.



Double Left Hand Billing.

(d) Estimating Rulings

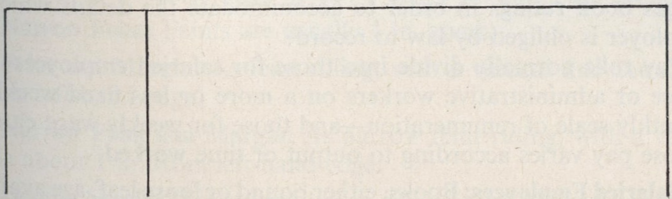
There is some demand for rulings which combine dimension and billing rulings on one sheet. Normally foolscap single sheets, they are sometimes called "account papers" and can vary considerably in pattern and can be with or without feints.



Example of an Estimating Ruling.

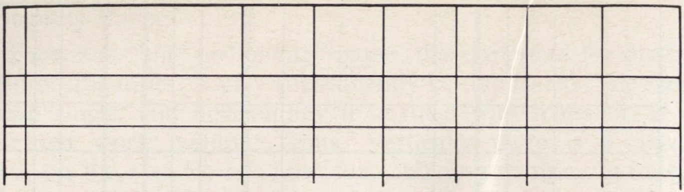
(e) Specification Ruling

This is of more general use to architects and is foolscap single size, ruled vertically with a margin on the left-hand side about $1\frac{1}{2}$ in. wide. If for manuscript use, it is also ruled with feints in the "stop-at-margin" style.



(f) Costing Rulings

These are principally used by builders, and are foolscap fly sheets. Horizontally the ruling consists of head-line or box-heading and feints. Vertically, any desired number of plain columns may be ruled.



Example of a Costing Ruling.

(g) Surveyors' Books

Various rulings are required in book form for use out of doors on sites. It is appropriate at this stage therefore to mention them. They may be divided into three principal groups, although other books are used for other purposes.

"*Dimension*" books are ruled similarly to the paper and are used for the same purpose. Normally the size is approximately 4 in × 8 in. oblong. Sometimes the pages are also numbered.

"*Field*" books are ruled with one or two vertical lines only in the centre of the sheet. Sometimes a graph pattern is used in addition. The size is approximately 4 in. × 8 in. oblong and they are used for land surveying.

"*Level*" books have several standard patterns with printed headings and feint lines. The usual size is approximately 8 in. × 5 in. upright. They are used for entering readings taken through a telescopic level, and for calculating the resultant levels of ground.

Bindings and quality of paper vary, but should be good enough to stand up to use out of doors in all weathers. The ink used in ruling should be waterproof.

Wages and Salaries Books

These require special mention, for the P.A.Y.E. method of collecting income tax has brought about certain alterations in the standard wages book rulings in order to accommodate the details which an employer is obliged by law to record.

Pay rolls normally divide into those for salaried employees—*i.e.*, office or administrative workers on a more or less fixed weekly or monthly scale of remuneration—and those for weekly wage earners, whose pay varies according to output or time worked.

Salaried Employees: Books, either bound or loose leaf, are available which have columns ruled to record the gross pay and the various deductions which have to be made for income tax, national insurances, superannuation, etc., in order to arrive at the net amount earned for the period. These books are normally arranged so that the first page is of ordinary quarto or foolscap size, with a narrative column on the left in which to enter the names of the various employees and cash columns on the right, while succeeding pages are cut away on the left to the cash columns so that the narrative column is visible throughout, thus saving the necessity of writing the names each week or month.

Weekly Wage Earners: The computation of earnings for this class of employee is somewhat involved. The wages book in this case requires to be ruled with a column for each working day so that, if necessary, the number of hours worked each day may be recorded, together with overtime periods and their different rates of pay. The main difficulty here is that, although the cash in the pay packet may be counted, without some detailed explanation it is virtually impossible for the employee to calculate how the amount is arrived at. A slip should, therefore, be included in the envelope which shows all the calculations and is, in fact, a summary of the wages book entry.

Attention is directed to the wage paying system outlined in the loose leaf section whereby three records may be produced at one writing, thereby saving much time and eliminating errors.

Foreign Currency and Decimal Rulings

One or two manufacturers keep stock lines with this type of ruling. This is because they have an export market and perhaps a special demand in this country as a result. However, when this country changes to the decimal coinage system, then undoubtedly many of our standard rulings will be altered to meet the situation.

Exercise Book Rulings

These are well stabilized and uniform and, in the main, cover all usual requirements. It is rare that a special exercise book has to be made because the ruling is not a stock pattern. The colours of the feint lines can be blue, green or grey, and if vertical lines are used they are usually in red. The rulings are as follows.

Feint: Line spacing normally $\frac{1}{3}$ in. apart. (For educational use they can be obtained with $\frac{7}{16}$ in., $\frac{5}{8}$ in., $\frac{3}{4}$ in. and 1 in. spacing.)

Narrow Feint: Feints are usually $\frac{1}{4}$ in. apart.

Feint and Margin: As feint ruling, with a vertical line about 1 in. from left-hand edge.

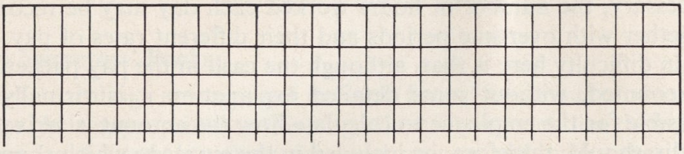
Narrow Feint and Margin: As narrow feint ruling, with a vertical line about 1 in. from left-hand edge.

Double Small: This is mainly for educational use and consists of 2 feints $\frac{3}{16}$ in. apart at $\frac{1}{2}$ in. intervals.

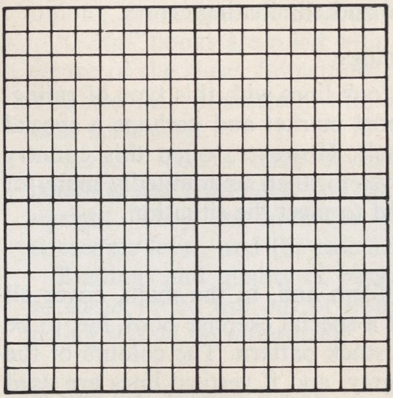
This spacing can be varied, and called extra narrow, narrow, medium and wide double small accordingly.

Double Small with Guide Line: This is a variation of the above, with a red feint midway between each pair of feints.

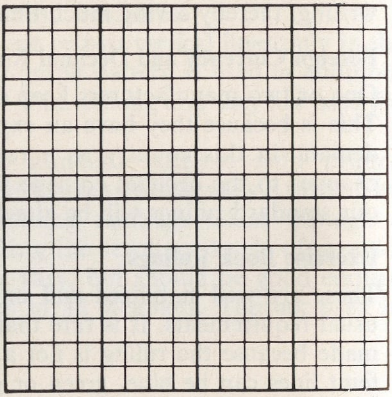
Quadrille: This is a pattern with feint lines ruled horizontally and vertically forming squares. The usual spacing is $\frac{1}{4}$ in., but again, for educational use, $\frac{1}{3}$ in. and $\frac{1}{2}$ in. squares are also obtainable.



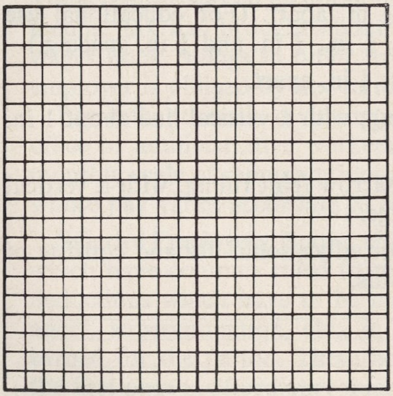
Graph Rulings: Owing to the need for accuracy, these patterns are normally produced by lithography. Since the misnomer "ruling"



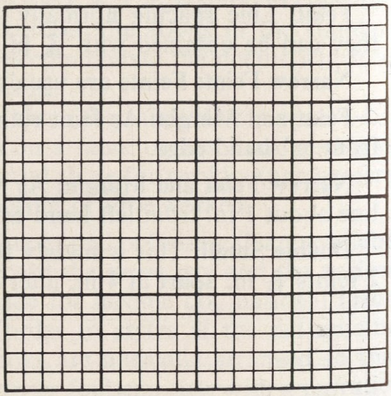
Eighths and One Inch



Eighths and Half Inch



Tenths and One Inch



Tenths and Half Inch

will probably continue to be used, they may profitably be reviewed under this heading.

Lines run vertically and horizontally to form a type of quadrille pattern. They can "run off" the edge of the sheet, or they can be "stopped" approximately half to three-quarters of an inch from all edges, thus producing a border. The pattern is further sub-divided at $\frac{1}{2}$ in and/or 1 in. intervals with heavier or red feints. The most popular spacings are as follows:

One-eighth and one inch.
One-tenth and one inch.
Millimetres and centimetres.

The graph pattern can be on alternate pages with the other page ruled feint or feint and margin. While this type of book is often called a graph book, other names are also used according to the particular use—*i.e.*, science book, physics book, laboratory note book.

Other books for special purposes are:

Nature Note Books: Feint ruled sheets interleaved with cartridge paper: sometimes called botany books.

Geography Books: Feint or feint and margin with alternate leaves plain.

Mapping Books: Usually plain sheets, but sometimes with a coloured border.

Music Manuscript Books: Ruled with 6 or 12 staves and sometimes interleaved with feint ruled sheets.

Book-keeping Books: These are normal account book rulings with head-line but made with a cheaper paper for student use.

All the above books are available in a variety of bindings from the stitched type to quarter bound, and better-class books may even be cased.

Special Patterns

These are necessary only when a book is ruled and made to requirements outside the normal run of business, and in such cases an old account book is often submitted from which it is possible to take a pattern of the ruling.

As a large proportion of account book business is special work, it is important that the young stationer should make himself proficient in taking special orders quickly and correctly. Slight mistakes in ruling, printing, etc., when making a new book, may render it useless, and not only may the customer refuse to accept the book, but he may be adversely influenced with regard to future orders.

This annoyance and loss of business can be avoided by the exercise of a little care and intelligence. How to make such patterns will be explained in section 10.

4. Book Sizes

At this stage it is appropriate to consider the various sizes used and how they are arrived at.

The size of book is determined by the size of the flat sheet of paper from which it is made and the number of leaves obtained from that sheet. For example, a sheet of foolscap which is folded:

Once—is known as a foolscap folio, giving two leaves or four pages.

Twice—(once in each direction) is known as a foolscap 4to, giving four leaves or eight pages; (twice in one direction) is known as a foolscap long 4to, giving four leaves or eight pages.

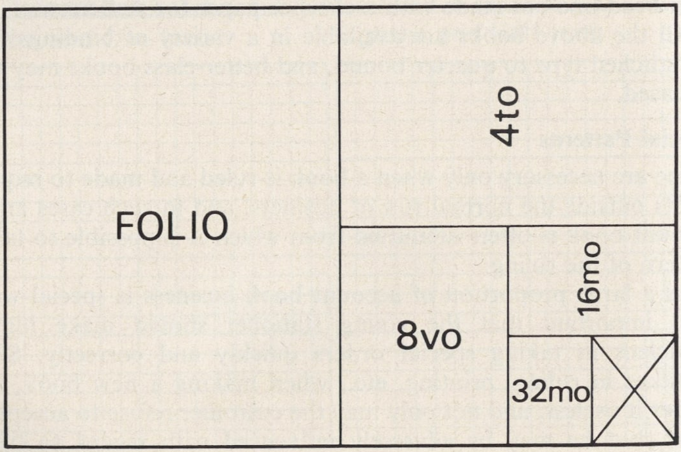
Three times—(alternate ways) is known as a foolscap 8vo, giving eight leaves or sixteen pages (or once in one direction and twice in the opposite direction) is known as foolscap long 8vo.

Four times—(alternate ways) is known as foolscap 16mo, giving 16 leaves or 32 pages:

so—

Folio means	..	2 out	8vo means	..	8 out
Quarto ,,	..	4 ,,	12mo ,,	..	12 ,,
6mo ,,	..	6 ,,	16mo ,,	..	16 ,,

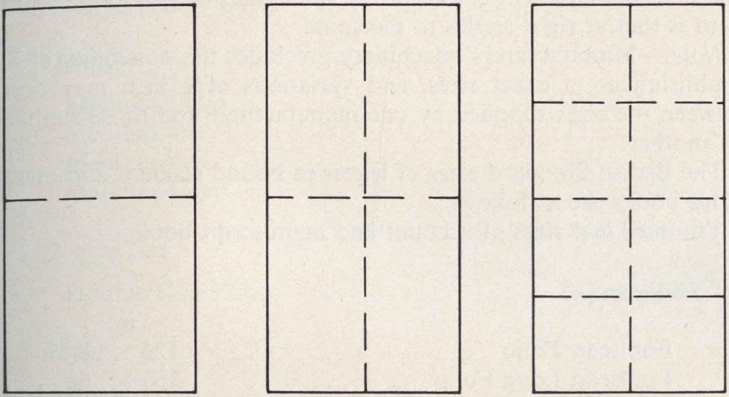
and so on.



Folds of a Sheet.

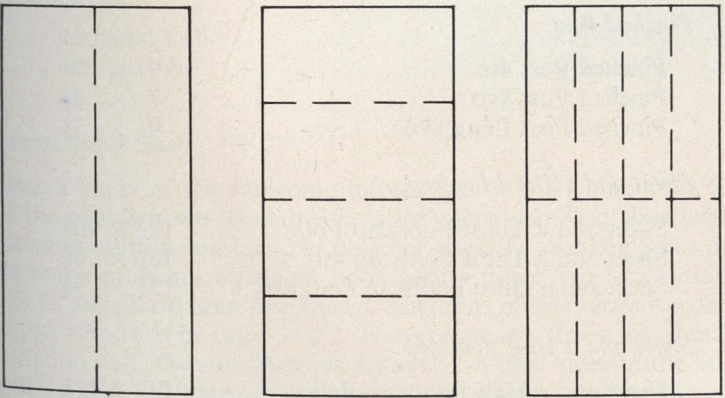
As there are many different sized flat sheets it is important that the sub-division—*i.e.*, folio or octavo—is prefixed by the name of the standard sheet that is being used. For instance, if foolscap is to be used, then the sub-division would be foolscap folio or foolscap octavo. Alternatively, if large post size were being used, then the sub-divisions would be large post folio or large post octavo.

The basic method of folding produces "broad" sizes—*i.e.*, where each succeeding sub-division is made by folding across the greater dimension.



Folding Across Greater Dimension.

It is possible, however, to fold the standard sheet across the lesser dimension and this produces "long" sub-divisions. To clarify this often puzzling distinction, the diagrams that follow show the differences:—



Folding Across Lesser Dimension.

If these diagrams are studied in conjunction with the trimmed leaf sizes, the various folds will soon become clear.

Before detailing the various book sizes, it must be pointed out that books can be bound "upright" or "oblong." Unless stated otherwise, books are usually taken to be upright and the size expressed with the largest dimension first—*i.e.*, large post quarto 10 in. × 8 in. (upright) or large post oblong quarto 8 in. × 10 in.

Sizes of Leaves

The first measurement is that of the spine, and the second measurement is that at right-angles to the spine.

Note.—Manufacturers' machinery precludes the possibility of the establishment of exact sizes, and variations of ⅛ inch may occur between the sizes supplied by one manufacturer and those supplied by another.

The British Standard sizes of leaves in bound account and manuscript books are as follows:

Trimmed leaf sizes of account and manuscript books—

Foolscap.

	in.
Foolscap Folio	12¾ × 8
Foolscap Long Folio	16 × 6⅜
Foolscap 4to	8 × 6⅜
Foolscap Long 4to	12¾ × 4
Foolscap 8vo	6¼ × 4
Foolscap Long 8vo	8 × 3⅛
Foolscap 12mo	5¼ × 3⅛
Foolscap Long 12mo	6¼ × 2⅝
Foolscap 18mo	4⅛ × 2⅝

Pinched Post.

Pinched Post 4to	9 × 7
Pinched Post 8vo	7 × 4½
Pinched Post Long 8vo	9 × 3¼

Sheet and a Third Foolscap.

Sheet and a Third Foolscap Folio	12¾ × 10¾
Sheet and a Third Foolscap 4to	10¾ × 6⅜
Sheet and a Third Foolscap Long 4to	12¾ × 5⅜

Sheet and a Half Foolscap.

Sheet and a Half Foolscap Folio	12¾ × 12¼
Sheet and a Half Foolscap Long 4to	12¾ × 6⅛

Demy.

Demy Folio	14¾ × 9½
Demy Long Folio	19 × 7⅜
Demy 4to	9½ × 7⅜

Large Post.

Large Post Folio	16 × 10
Large Post Long Folio	20 × 8
Large Post 4to	10 × 8
Large Post 8vo	8 × 5

Medium.

Medium Folio	17¼ × 11
Medium 4to	11 × 8⅝
Medium 8vo	8⅝ × 5½
Medium 16mo	5½ × 4¼

Double Cap.

Double Cap Folio	16¼ × 13

Royal.

Royal Folio	18¼ × 11½
Royal 4to	11½ × 9⅛
Royal 8vo	9⅛ × 5¾

Super Royal.

Super Royal Folio	18¼ × 13

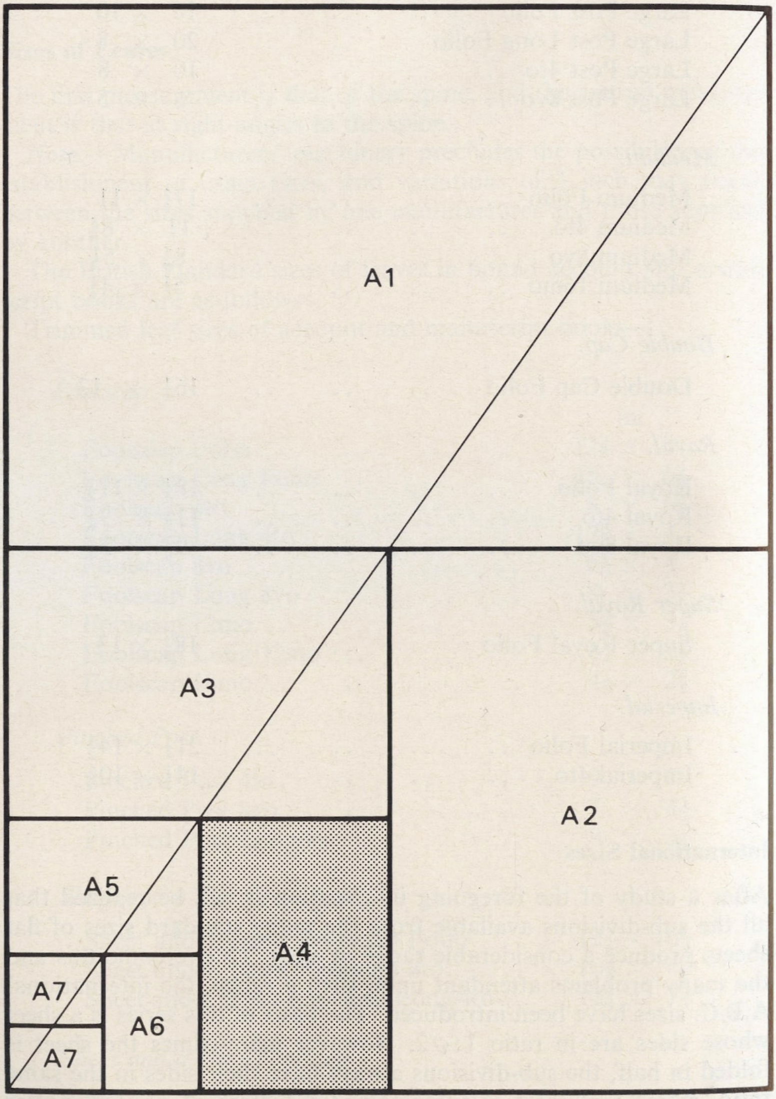
Imperial.

Imperial Folio	21¼ × 14½
Imperial 4to	14½ × 10⅝

International Sizes

After a study of the foregoing information it will be realized that all the sub-divisions available from the many standard sizes of flat sheets produce a considerable range of sizes. To overcome this and the many problems attendant upon such a range, the international A.B.C. sizes have been introduced. The basis of this series is a sheet whose sides are in ratio $1:\sqrt{2}$. However many times the sheet is folded in half, the sub-divisions always have their sides in the same ratio, which facilitates enlargement or reduction of printed matter by photographic means.

Further information on this subject will be found under paper sizes, but for convenience it may be stated at this point that the A series of sizes is the one most revelant to this subject: undernoted are a diagram showing the sub-division and a list of the appropriate sizes.



International "A" Size Sub-Divisions.

Size	in.	mm.
A	33⅛ × 46¾	841 × 1189
A1	23⅜ × 33⅛	594 × 841
A2	16½ × 23⅜	420 × 594
A3	11¾ × 16½	297 × 420
A4	8¼ × 11¾	210 × 297
A5	5⅞ × 8¼	148 × 210
A6	4⅛ × 5⅞	105 × 148
A7	2⅞ × 4⅛	74 × 105

All these sizes are trimmed sizes so as to ensure consistency of supply.

From the above table it will be obvious that terms such as folio, quarto, octavo, etc. are both ambiguous and unnecessary. Each term has several different meanings governed by the original size of the sheet, which size must be stated before the term has full meaning. On the other hand, use of the designation of the international size A2, for example, indicates a positive size of 16½ in. × 23⅜ in.

5. Book Thicknesses

The British Standard for quoting contents of all account and manuscript books is to quote the number of leaves or pages without reference to quires or fractions of cut reams or similar terms. The contents are to be "clear." Further, in quoting contents of ledgers, minute books, or other manuscript books including an index, the contents must be quoted inclusive of index—*e.g.*, "500-leaf single ledger" comprises a 24 leaf index and 476 leaves ruled single ledger.

Some manufacturers, however, still describe the thickness by reference to quires.

Where thickness is given in quires, this is accepted as "inclusive" of all the paper in the book. For instance, a 2-quire foolscap cash book would consist of 48 sheets or 96 leaves. From this must be deducted from the ruled sheets the leaves for the ends and pastedowns—that is, one leaf at each end for pastedowns and two leaves at each end for the plain ends—so that the actual number of folios would be 90. Where the book is twice the thickness, only the same number of leaves would be required for the ends, so the total number of ruled leaves in a 4-quire cash book would be 186. In the case of ledgers etc. which include a fast index, the sheets of the index would also be taken out of the total (a one-letter index uses 26 leaves) and the number of ruled pages correspondingly reduced.

Unfortunately, there is a lack of uniformity between account book makers who use this method as to the exact number of leaves deducted for end-paper, pastedowns and indexes, with the result that a 3-quire book, for example, may have a different number of leaves in the actual main portion in the case of one make as opposed to another.

In ordering special account books, the use of the "quire" method is to be deprecated owing to this lack of uniformity. It is best in such instances to give the thickness of the book by stating the number of leaves "clear."

It is also recommended that the word "pages" is best avoided, as it is often confused with "leaves." One leaf is equal to two pages and, unless this is clearly understood, the final result is either a book made twice as thick as required or one only half as thick.

6. Binding and Manufacture of Sewn Books

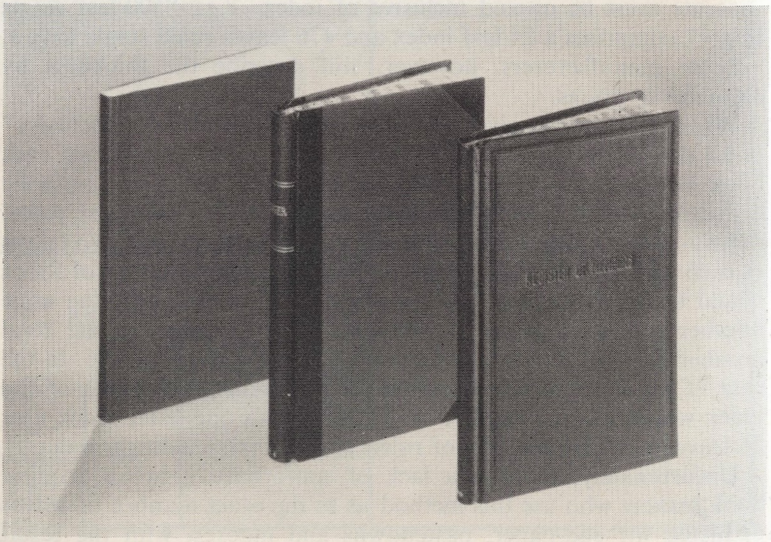
Styles of Binding

Before proceeding to deal with the subject of binding it will perhaps be as well to define certain terms which will be used under this heading. They must be known and thoroughly understood.

Full Bound: This means that style of binding in which the covering material is of one piece.

Half Bound: This signifies that style of binding in which the spine and corner coverings are of one material and the remainder of another.

Quarter Bound: This refers to that style of binding in which the spine covering is of one material and the front and back covers of another.



Styles of Binding.

Methods of Binding

Before detailing the sequence of manufacture it is necessary at this stage to set out briefly the different types of binding methods.

(a) Section Sewn: This is where sheets are folded into sections and the sections are then sewn together by cotton or thread. This type of book can be further classified into:—

(1) Spring-back books—for better-class binding.

(2) Cased books—for medium qualities.

(3) Fast-back books—for cheaper qualities.

(b) Whip-Stitched Books: This method is usually for single sheets and very thin sections, and is effected by over-casting with thread on the outside of the binding edge.

(c) Stabbed Books: This is done by wire or thread and is a means of binding single sheets.

(d) Thermoplastic: This also is for binding single sheets by means of a synthetic glue, and has largely superseded the stabbing method, particularly for duplicate books, and is used also for some quarter bound books.

(e) Spiral Bound: Again, this is for single sheet binding and is effected by plastic or wire, on special machines.

(f) Stitched Books: These books are of one section only and the stitching is effected by means of wire or thread.

Methods of binding **(b)** to **(f)** will be more fully explained in section 9 of this chapter.

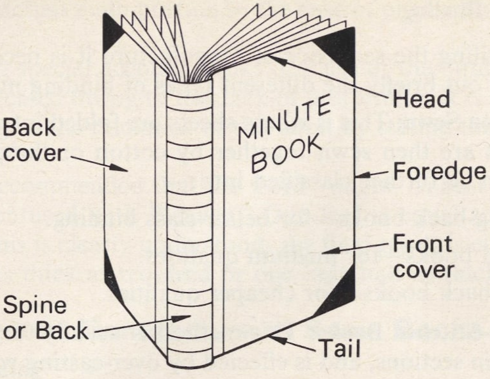
Section Sewn Books

To explain the various stages of manufacture a particular style and type of binding will be selected and for this purpose the **spring-back** book is suitable. Firstly, however, it should be noted that in this type of book (spring-back) there are three grades—*i.e.*, "common," "half-extra" and "extra."

These grades satisfy certain requirements with regard to their make up and to the materials used in their binding. Briefly, better-quality materials are used in "extra" binding than those used in "common" quality. "Half-extra" comes between the other two.

The vast majority of stock half bound books made to-day are made in "common" quality. In view of this, the sequence of operations described will, in the main, be applicable to this quality of binding. Variations in materials and methods for the "half-extra" and "full-extra" grades will be detailed separately.

The following illustration will assist in understanding the names given to various parts of the book.


Head
Back cover
MINUTE BOOK
Foredge
Front cover
Spine or Back
Tail

Nomenclature.

Ruling

The methods of ruling have already been detailed previously. It is sufficient therefore to state now that ruling and/or printing the paper would be the first stage in manufacturing.

Making-up

The next stage in the binding operations for an account book is known as "making-up." The ruled or printed sheets are folded, either by hand or machine, into sections of 4, 6, or 8 sheets (two

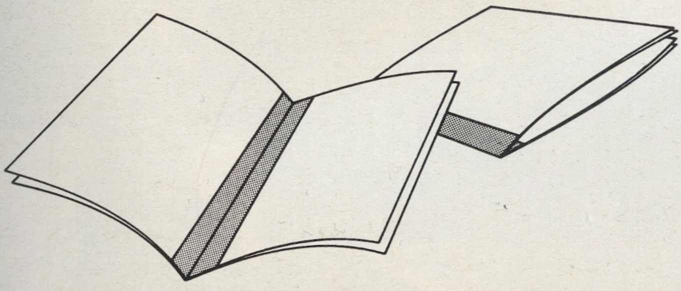
Making Up.

leaves to a sheet) according to the thickness of the paper or the thickness of the book.

The first and last few sections always receive a great deal of continuous wear, particularly if the book has an index in front, and with spring-back books (which will be described in detail later on) there is also the strain imposed by the spring back. For this reason the outside sheets of these sections are strengthened with cotton tapes. Maximum reinforcement would probably be obtained by pasting these tapes on the outside of the folds, but in practice it is not easy to glue the sections tightly together where tape meets tape. Consequently, the tapes are put down the outside fold of the first section, then inside the fold of the outside sheet of the next section, and so on, alternately, for as many sections as need to be taped. In practice, mass-produced books have only the first and last sections taped.

Joints

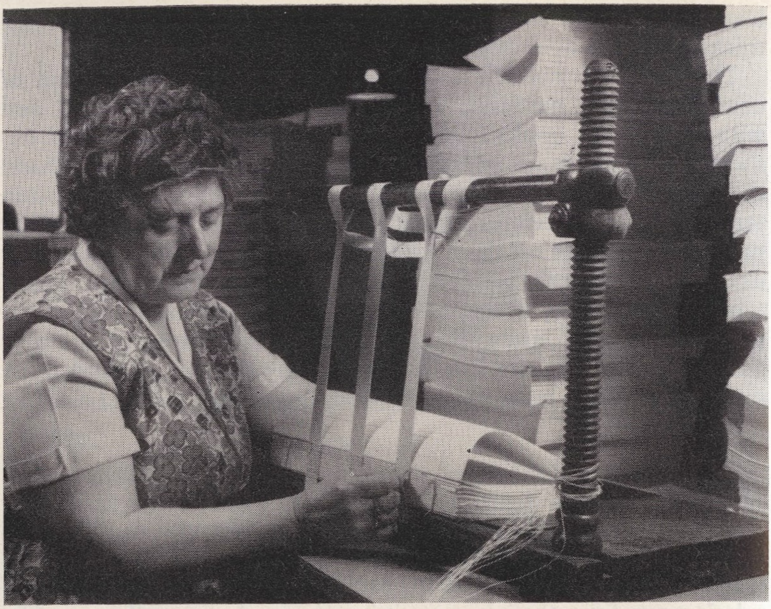
A pair of "joints" or "made-ends" must be prepared at this stage, ready for sewing on to the front and back sections of the book. Two sheets of paper are required for each joint; one may be a sheet of ruler's waste from the job, since it is not seen, but the other must be a clean, plain sheet. The sheets are joined with a strip of strong cloth and lined with marble paper, thus producing two single-sheet "sections." A strip of white cotton is then glued down the outside of the folds of these "sections" and when dry the "made-ends" are ready for sewing on.



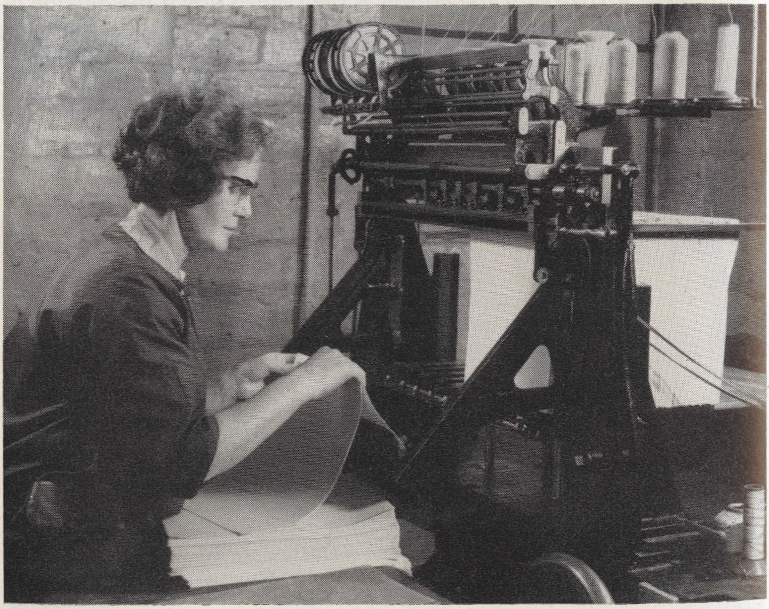
Joints or Made Ends.

Sewing

Sewing follows, and this is performed either by hand or machine. The latter method is mainly used today. Account books are always sewn through thick tapes with fairly strong cord thread; the sections are sewn together through these tapes, which are placed across the back of the book and project about 2 in. at each side.



Hand Sewing.



Machine Sewing.

There is very little outward difference between books sewn by the two methods, but, if the centres of the sections are examined when a book is opened out, the hand-sewn book will reveal a strong and substantial thread, while the machine-sewn will invariably show a double thread. It may be taken as a general rule that all stock books are machine-sewn.

After the sewing is completed the book is then ready for "forwarding."

Forwarding

A number of operations takes place at this stage.

(1) The outside leaf of the "joint" or "made end"—*i.e.*, the first and last sections—is pasted down to the leaf of the contents facing it.

(2) The spine of the book is glued and the glue rubbed well into the spaces between the sections.

(3) The edges of the book are trimmed.

(4) The spine is rounded—that is, beaten with a hammer, or rounded by machine, until it is shaped like a half circle.

(5) The edges are then marbled or sprinkled (the methods will be described separately).

(6) The pages are numbered, and, where an index is included, the index cuts are made. In the mass production of account books the index letters are stamped on to the index cuts in one operation. Where specials are made individually or red and black letters are required, this is usually left until the finishing stage.

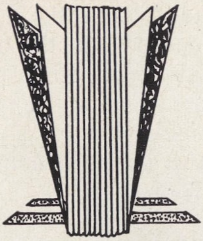
(7) The slips or tapes on which the sections are sewn are then drawn back and the book put between boards and placed in a press, where it is left until dry. In mass production, however, it is more usual to use a hydraulic press, in which the books can be left overnight.

(8) The book is then ready for the final operations. These will be explained after the various edge-colouring processes have been described.

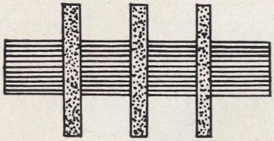
Process of Marbling

The term "marbling" refers to the method by which the edges of account books are coloured and patterned to resemble in some degree the strata of marble. It is a highly specialized operation, and the following is but a brief explanation of the process.

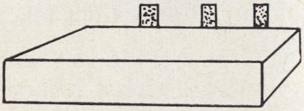
A wooden or enamelled iron trough is filled with marbling size made from a seaweed called carragheen moss (supplies of which are



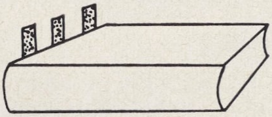
(i) Made Joints Pasted To 1st and Last Leaves



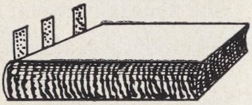
(ii) Spine Glued



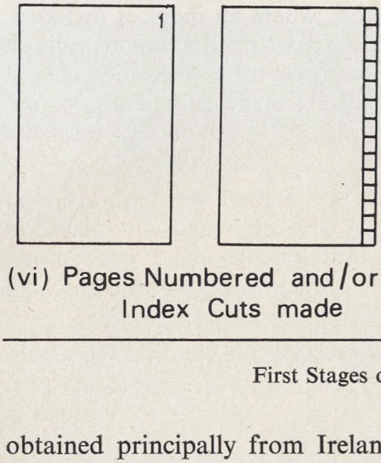
(iii) Edges Trimmed



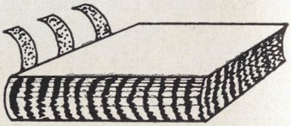
(iv) Spine Rounded



(v) Edges Marbled (or Sprinkled)



(vi) Pages Numbered and/or Index Cuts made



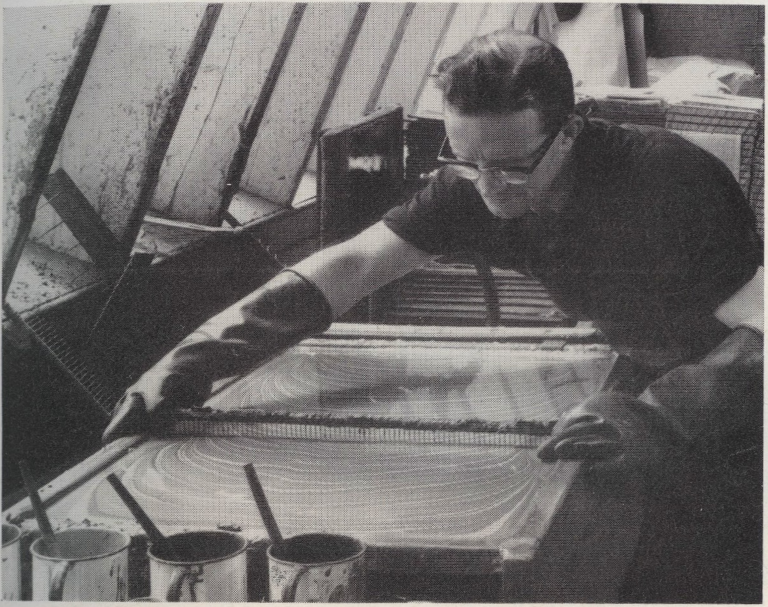
(vii) Sewing Slips Drawn Back Prior to Placing in press

First Stages of Forwarding.

obtained principally from Ireland) boiled in water, together with borax and formalin to act as preservatives.

Colours prepared specially for marbling purposes are poured into separate cups and thinned with water. A small quantity of ox gall is added to allow the colours to spread and to prevent them from mixing when dropped on the surface of the size in the trough. The ox gall surrounds each colour with a fine gelatinous film, and also keeps the colour on the surface of the size.

A stick or brush is dipped in each of the four or five colours in turn, and drawn lightly across the surface of the size, after which a coarse comb is drawn from end to end along the surface to produce the pattern.



Combing the Marbling Pattern.

The edges of the account books are then damped with a weak solution of alum which will help to fix the colours. They are now ready for marbling (two or three may be marbled at the same time if held tightly together). The edge of the book is lowered gently upon the coloured design on the surface of the size, and, when it is lifted off, the freshly marbled edge is finely sprayed with running water to wash away the surplus size. When it is dry the process is complete.

The pattern of the marbling is made to suit the book—*e.g.*, a large, thick book will generally have large pattern marbled edges, while a thin, quarto book will have a fine nonpareil design. Many manufacturers have, to a large extent, standardized marbling for stock books. This is a great help if books are stacked on shelves with only the edges visible. For instance, generally speaking, a flush book with a blue and white marbled edge is ruled feint only, and a flush book with red vertical lines will usually have a red and white marbled edge. A small private account book or a good-class memorandum book will probably have burnished, nonpareil marbled edges.

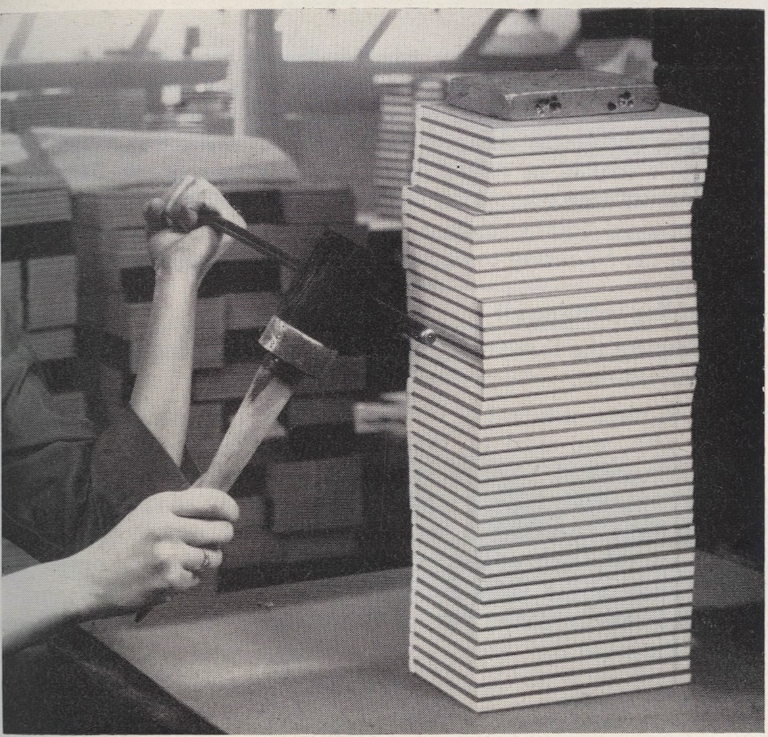
Washing Away the Surplus Size.

Marbling by Transfer

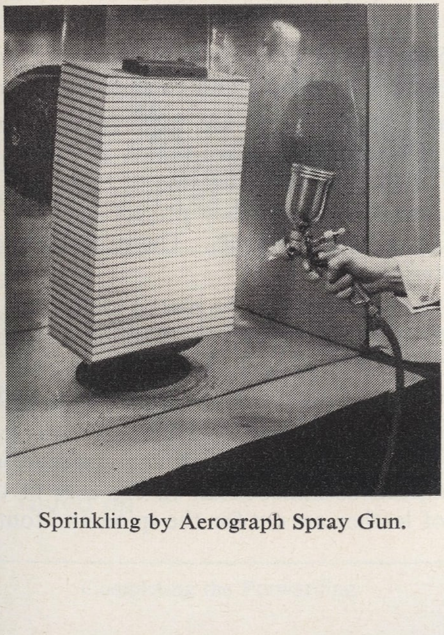
A cheaper and quicker method of marbling is by transfer paper—*i.e.*, transfer paper, on which the marbled design has already been printed, is "damped" on to the edges of the sewn books (before they are bound) and then peeled off, leaving behind the marbled pattern on the book edges. The result, however, is not as satisfactory as that obtained by the method described in the preceding paragraph.

Sprinkling

Instead of undergoing the process of marbling, the edges of cheaper bound books, some cased books, and quarter-bounds and flush-bounds in general, are sprinkled. This method of colouring is both inexpensive and expeditious. A pile of books is stacked flush with the edge of the bench, a brush is dipped in ruling ink and then knocked against an iron bar, which is held vertically in front of, and a short distance away from, the edges of the books in the pile. The colour flies off the bristles and appears on the book edges in the form of small dots. Different coloured inks are used, in the case of stock books, to indicate the various rulings—*e.g.*, a blue sprinkle might be used for books ruled feint only, a red sprinkle for books ruled feint with single cash lines, and perhaps the double cash ruled books might be sprinkled with two colours, first blue, then red. In modern factories large quantities are quickly and cleanly "sprinkled" by using an aerograph spray.



Sprinkling by Brush.



Sprinkling by Aerograph Spray Gun.

Stained Edges

Yet a further method is for edges to be stained "solid," or completely, with one colour, and it is employed perhaps more often on memorandum books than on account books. It is cheaper than marbling but not as cheap or expeditious as sprinkling. A piece of sponge is soaked in ruler's ink and lightly passed over the book edges, until they assume an even shade overall, and no vestige of their original colour remains to be seen. There is no pattern or grain in the colouring to cause it in any way to resemble marbling.

Forwarding (continued)

To complete the forwarding operations the following processes are now carried out.

(1) A piece of board or stiffener is glued along each side parallel with, and close to, the spine, on to the waste sheet of the "made-end." These boards are the length of the back from the top edge of the top slip, to the bottom edge of the lowest slip and about 2 in. wide and $\frac{1}{16}$ in. thick, registering roughly with the strip of joint cloth on the board side. The projecting ends of the tapes are glued down on to these stiffeners—sometimes called "levers," as they lever the rolled back off the spine.

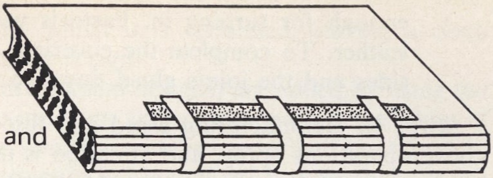
(2) A "rolled" or "spring" back is now prepared. This is made of a single piece of board, or of two pieces of board glued together, which is heated until it becomes pliable, wrapped round a roller (of a diameter equal to the thickness of the book) with paper and rolled to and fro on a solid bench. Afterwards it is allowed to dry and to become firm.

(3) The spine is then lined or "clothed" with strips of leather placed between the tapes and glued to the levers on each side.

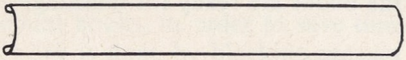
(4) The sides of the book are made next. These are usually pieces of heavy strawboard which are glued into position, on top of the projecting lengths of tapes and clothings. The boards are so cut that they project over the head, tail and fore-edge of the contents. These projections are called "squares."

(5) The rolled back can now be placed in position on the spine of the book. When a "spring-back" book is opened, the boards swing on the levers and the levers in turn push the rolled back off the spine, allowing it to open freely and with a slight spring.

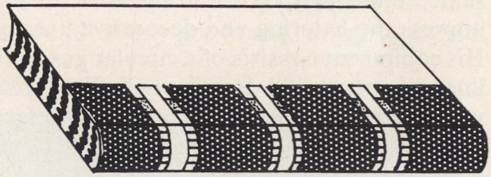
(6) The book is now ready for covering according to the style required, full or half bound. In the case of the latter style, pieces of leather are cut for the spine and four corners, large



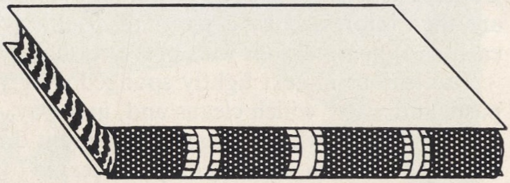
(i) Stiffener Glued on and Tapes Glued Down



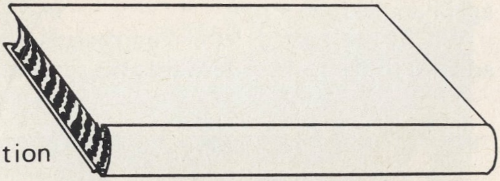
(ii) Rolled Back Prepared



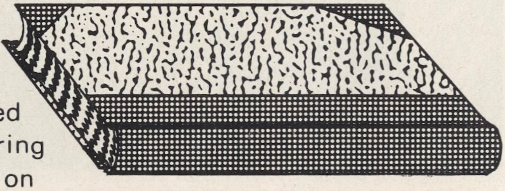
(iii) Glued Clothings in Between Tapes



(iv) Boards glued into Position



(v) Rolled Back Placed into Position



(vi) Leather Corners and Spine Pasted on – Side covering Material Glued on

Completing the Forwarding.

enough for turning in. Paste is used for the fixing of the leather. To complete the covering, material is glued to the sides and the joints glued down to the inside of the covers.

NOTE. In manufacturing cased and fast-back books, not all the above operations apply, and attention is drawn to the appropriate headings that follow further on. At this stage, however, the operations involved in the term "forwarding" are now all concluded, and the books are ready for finishing.

Finishing

To complete the binding of an account book, the book is passed to a skilled craftsman known in the trade as a "finisher." His duty is to impress the lettering and decorative lines on the cover of the book. His equipment consists of a circular gas or electric stove, brass letters, lines or ornamental designs, each fitted with a wooden handle, brass wheels with plain line or ornamental design, gold leaf and metal foil.

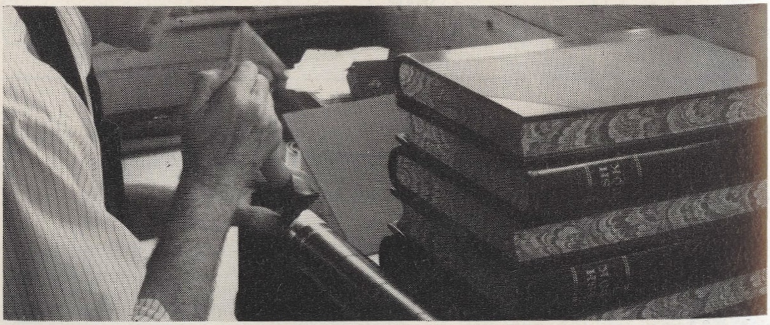
Briefly, the method of finishing a basil bound book (the most popular binding) is as follows.

The book is placed into a wooden vice and, with dividers or a gauge, the panels are marked out on the back, and the dividing lines are then impressed by a jigger (a double whipcord with handle at each end) being drawn with pressure sharply from side to side.

The leather is next lightly sponged over with a weak solution of paste and water which cleans and, in a way, sizes the leather so that when the glair (white of egg) is applied it does not sink in.

The title is then impressed by the heated tools on the second panel, after which the impressions are painted with glair (using a camel hair pencil), gold leaf is laid over the lettering and the heated tools are again applied.

Where the heated letters or designs touch the gold, the gold adheres to the glair. Afterwards the surplus gold is picked up with a



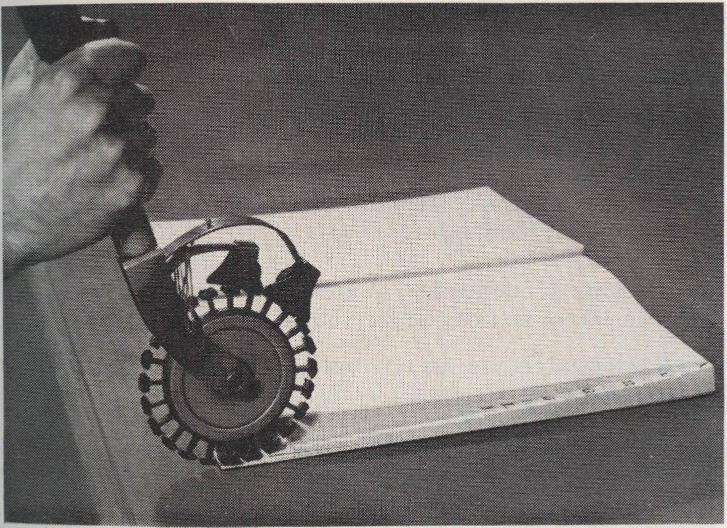
Titling Half Bound Account Books.

piece of raw rubber from which it is reclaimed, leaving a clean impression of the lettering or design.

Blind-tooled lines (or ornamental designs) are added by using the heated brass wheels, running them with pressure along the edges of the leather used for corners and back in the case of half bound work, or near the edge of the covers in full bound work. A leather varnish is applied to the surface of some leather to give a polished or glazed appearance, and also to preserve it.

In the mass production of account books, in order to save time and cost, much of the finishing work is done by blocking presses.

The finisher will also stamp or roll in the letters on to the index cuts which were made at an early stage of "forwarding." In addition, it is part of the finisher's duty to watch for any defects which may have occured in forwarding and, if any are found, to try to correct them.



Rolling in the Index Letters.

Spring-back Books

The "spring-back" book is usually to be found in better-class account books which are intended to last for a long time. As already explained, it is formed by fitting a tubular back on to the spine of the book during binding. This back springs away from the spine when the book is opened, leaving a hollow between the sections and the spring back, hence the term "open back."

These books usually include a made end-paper placed at each end of the book, together with a lining for the first and last sheets. These make for strength and durability, which, coupled with ease and flatness of opening, form the main features of this type of book.

Of special note is the correct manner to open new spring-back books: they should be opened a few sheets from the front, a few sheets from the back, and so on, a few sheets at a time, alternately from the front and the back, until the whole book has been gone through.

The purpose of doing this is to "crack" or "break down" the glue along the spine into smaller particles and thus to avoid the splitting or separating of the sections.

This method of opening should always be impressed upon a new customer, for all too frequently, through ignorance, backs are broken, and the binder is blamed for inefficient work, when, in fact, it is not his fault at all.

Qualities of Spring-back Books: It has already been stated that this type of book can be made in three grades—*i.e.*, common, half-extra and full-extra. The quality of materials and method of manufacture differ in the following respects, but it must be stated that variations are found in bindery to bindery.

(1) Quality and size of sewing tapes.
(2) Quality of thread.
(3) Method of sewing.
(4) Method of taping sections.
(5) Quality of clothings.
(6) Quality of joints.
(7) Quality of and method of attaching the spring back.
(8) Quality of boards and method of attaching them.

The following tables are the appropriate British Standards for the three qualities.

SEWING SLIPS FOR BOOKS LARGER THAN FOOLSCAP FOLIO

Size	Bindings		
	Common	Half-extra	Extra
Demy folio	3—⅝ in. or 3—1 in. tape	3—⅝ in. or 3—1 in. web	4—1 in. web
Medium folio	4—⅝ in. or 3—1 in. web	4—⅝ in. or 3—1 in. web	4—1 in. web
Royal folio	4—1 in. web	4—1 in. web	5—1 in. web
Super royal folio	4—1 in. web	4—1 in. web	5—1 in. web
Imperial folio	4—1½ in. web	5—1 in. web	5—1¼ in. or 6—1 in. web

ACCOUNT BOOK MATERIALS AND BINDINGS

Bindings	Common	Half-extra	Extra
Slips*	Two 1 in. or three $\frac{5}{8}$ in. stiff tape	Two 1 in. or three $\frac{5}{8}$ in. webbing	Three 1 in. best spindle webbing
Thread	3-cord cotton	3-cord cotton	4-cord linen
Sewing	Machine or hand sewn	Machine or hand sewn	Hand sewn. Sewn round the slips of joints, and first and last sections
Section taping	Not taped	First and last sections taped outside, and pasted to adjoining sections	First and last sections taped inside and outside; the outside tapes pasted to adjoining sections; additional tapes inserted between second and third and third and fourth sections from each end
Clothings or tabbings	Cloth	Leather	Basil, goat or calf leather
Joints	Cloth joinings, paper linings	Holland or union joinings; suitable paper linings; backed paper	Canvas joinings; suitable paper linings; backed calico
Spring-back	Strawboard, drawn on with cover	Machine-made millboard, covered paper, drawn on with cloth	Best quality millboard separately attached
Boards	Single strawboard (see separate table)	Split board (see separate table)	Split best quality millboard (see separate table)

* This specification for slips refers to foolscap folio books; for larger sizes, see separate table.

SUBSTANCES OF BOARDS FOR ACCOUNT BOOKS

NOTE. These board substances are based on the use of the following thicknesses of paper:—Foolscap 16 lb., Demy 25 lb., Medium 33 lb., Royal 44 lb., Imperial 74 lb.

Variation in weight of paper will require appropriate variation in substance of board.

		Bindings						
		Common		Half-extra			Extra	
	No. of usable leaves	Straw-board	Caliper	Straw-board	Machine made mill-board	Caliper	Best quality millboard	Caliper
		lb.	in.	lb.	penny	in.	penny	in.
Foolscap folio	150	2½	= 0·116	2	+ 6	= 0·125	8xx	+ 6 = 0·152
	200	3	= 0·135	2½	+ 6	= 0·152	8x + 7	+ 6 = 0·169
	250	3	= 0·135	2½	+ 6	= 0·152	8x + 7	+ 6 = 0·169
	300	3½	= 0·160	3	+ 6	= 0·171	10	+ 6 = 0·180
	400	4	= 0·180	3½	+ 6	= 0·196	8x + 8x	+ 6 = 0·206
	500	4½	= 0·205	4	+ 6	= 0·216	8xx + 8x	+ 6 = 0·237
Demy folio	150	3	= 0·135	2½	+ 6	= 0·152	8x + 7	+ 6 = 0·169
	200	3½	= 0·160	3	+ 6	= 0·171	10	+ 7 = 0·192
	250	3½	= 0·160	3	+ 6	= 0·171	10	+ 7 = 0·192
	300	4	= 0·180	3½	+ 6	= 0·196	8x + 8x	+ 6 = 0·206
	400	4½	= 0·205	4	+ 6	= 0·216	8xx + 8x	+ 6 = 0·237
	500	5	= 0·225	4½	+ 6	= 0·241	8xx + 8x	+ 7 = 0·249
Medium folio	150	3½	= 0·160	3	+ 6	= 0·171	8xx + 7	+ 6 = 0·200
	200	4	= 0·180	3½	+ 6	= 0·196	8x + 8x	+ 6 = 0·206
	250	4	= 0·180	3½	+ 6	= 0·196	8x + 8x	+ 6 = 0·206
	300	4½	= 0·205	4	+ 6	= 0·216	8xx + 8x	+ 6 = 0·237
	400	5	= 0·225	4½	+ 6	= 0·241	8xx + 8x	+ 7 = 0·249
	500	5½	= 0·250	5	+ 6	= 0·261	8xx + 8xx	+ 6 = 0·268
Royal folio	150	4	= 0·180	3½	+ 6	= 0·196	8x + 8x	+ 6 = 0·206
	200	4½	= 0·205	4	+ 6	= 0·216	8xx + 8x	+ 6 = 0·237
	250	4½	= 0·205	4	+ 6	= 0·216	8xx + 8x	+ 6 = 0·237
	300	5	= 0·225	4½	+ 6	= 0·241	8xx + 8x	+ 7 = 0·249
	400	5½	= 0·250	5	+ 6	= 0·261	8xx + 8xx	+ 6 = 0·268
	500	6	= 0·270	5½	+ 6	= 0·286	10 + 8xx	+ 6 = 0·296
Imperial folio	150	4½	= 0·205	4	+ 6	= 0·216	8xx + 8x	+ 6 = 0·237
	200	5	= 0·225	4½	+ 6	= 0·241	8xx + 8x	+ 7 = 0·249
	250	5	= 0·225	4½	+ 6	= 0·241	8xx + 8x	+ 7 = 0·249
	300	5½	= 0·250	5	+ 6	= 0·261	8xx + 8xx	+ 6 = 0·268
	400	6	= 0·270	5½	+ 6	= 0·286	10 + 8xx	+ 6 = 0·296
	500	6½	= 0·295	6	+ 6	= 0·306	10 + 10	+ 6 = 0·324

Cased Books

Cased books, as the name implies, are books which are inserted into covers completed as entirely separate units. They attempt, with a considerable degree of success, to provide the better opening and "lying flat" properties of the spring-back book at a lower price, but in doing so sacrifice much strength and durability.

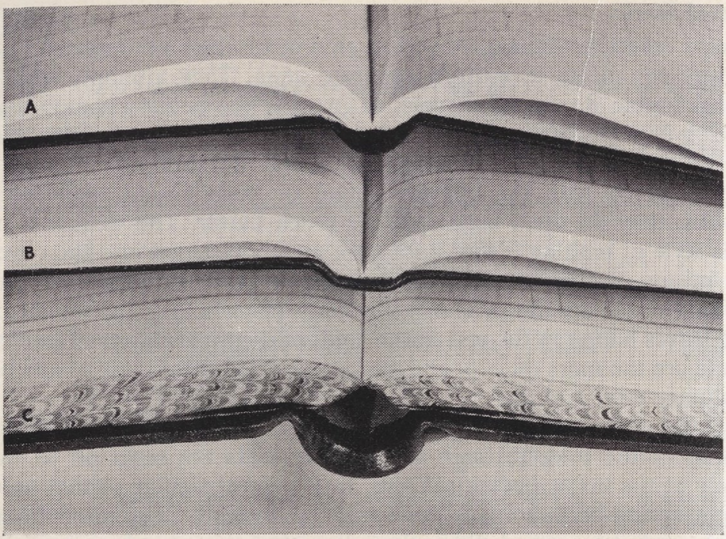
Compared with the quarter bound or flush bound, tight-back books, they do open better and lie much flatter. The weakness of this style of binding is that books are merely fastened into the cover by means of glue, the end sheets being stuck to the insides of the boards which are the sides of the covers. The whole of the weight of the leaves hangs on the end sheets, and, of the three classes of books, these are the most quickly and easily separated from their covers by ordinary wear and tear.

If the plain wastes have a strip of white cotton pasted down the inside of the fold, through which these ends are sewn on to the body of the book, back and front, or if a joint similar to that used for a spring-back book is sewn on, the strength of a cased book is somewhat increased. Even then, however, these books cannot be made with more than about 500 pages owing to the drag of the weight of the leaves on the end sheets.

The main point of cased books is that they imitate the "spring-back" in lying flat and yet cost less to produce. However, the back is practically flat, so that the centre sections, which have no other support, hang on the sewing tapes and in use tend to move forward, so that the fore-edge assumes an uneven convex appearance. The covers are made with squares and are usually covered with rexine or some other leather substitute at the back and corners, with cloth sides similar to those of the half bound spring-back book. The boards which are used are lighter than those on the equivalent spring-back book and about the same thickness as those on a flush book of the same size. The back is not fastened down to the sections, all covering material is turned in, even with the quarter bound style cases, and the edges of the books are marbled, after the style of spring-back books, but usually with fewer colours and with a pattern that is more quickly combed out in order to cut down costs as much as possible.

Fast-back Books

All cheaper account books are made with a fast back, as distinct from the open or spring back: the term indicates that the covering material is affixed directly to the spine of the sewn sections. They are invariably quarter bound with materials varying according to the type of the book. Backs are usually leathercloth cut flush with leatherette paper sides which are turned in, although many books are produced using substitute materials for both backs and sides.

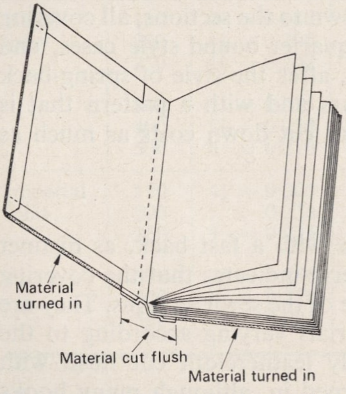


(A) Cased Book. (B) Fast-back Book. (C) Spring-back Book.

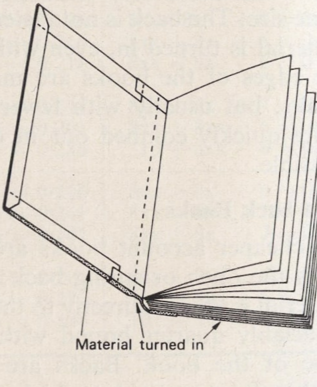
A cheaper method of production is not to turn in the sides but to leave the siding material flush with the body of the book. As is the case with nearly all quarter-bindings, there is much less protection for the leaves than when the sides project over the leaves. This latter feature, applicable to all spring-back books, is termed "squares."

The usual descriptions for these types of book can be summarized as follows:

Cut Flush: The boards and side covering are cut flush with the leaves, leaving "raw edges" to the spine and boards.


Material turned in
Material cut flush
Material turned in

Quarter Bound Cut Flush and Sides Turned in.


Material turned in

Quarter Bound, Flush, Back and Sides Turned in.

Cut Flush and Turned In: The quarter binding material is cut flush, but the material covering the boards is turned in over the edges of the boards.

Flush Turned In: The spine covering and the board covering are all turned in, thus giving a more pleasing appearance to the book.

As these methods need variation in manufacture, the cost of production also varies. Thus a cut flush book would be cheaper to produce than one flush turned in.

7. Indexing, Numbering and Lettering

Some attention should now be given to the above. These three terms will be dealt with individually, but collectively they are sometimes known as "extras" (not to be confused with the terms of spring-back quality—*i.e.*, half-extra etc.)

Indexing

Some account books are indexed and others are not. An index is a device to enable easy and rapid reference to be made to information, or to some item, contained in a book. Indexes fall roughly into three main forms:

(*a*) Leaves cut back from the fore-edge to form "steps" or non-projecting "tabs," which are marked (usually with letters or figures) so that the total number of items may be divided into smaller quantities of a selected character. When this division has been made it is simpler to indicate the precise place in a book of a particular item.

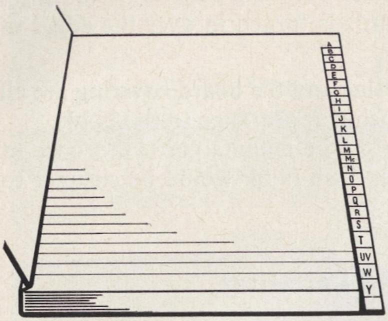
(*b*) Tabs which project from the leaves of a book at different positions along the edges (so that all are visible at once), with a specially determined number of leaves between each pair of tabbed leaves. This form of index is radically different from the other two, because it depends for its effectiveness upon all items being entered in a correct and indicated place, whereas other indexes are used to mark the correct place after entries have been made.

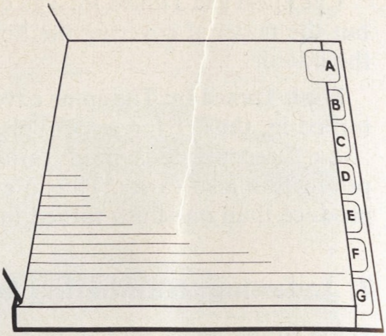
(*c*) Two or three pages ruled and/or printed to form divisions, into which a total number of entries may be sorted, with the same objective as in (*a*).

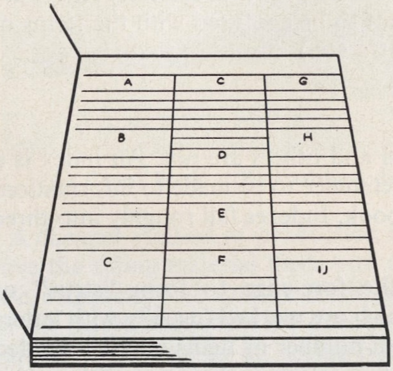
Non-Projecting Indexes

These divide again into:

Index in front.
Indexed through.







Top left: "Step" or Non-Projecting Tab Index.
Top right: Projecting Tab Index.
Left: Sheet Index.

Index in Front: This is probably the commonest type of post-entry reference, and usually consists of not less than 12 or more than 48 leaves at the front of the book. These leaves are usually ruled, but the ruling patterns vary from simple "common" or "narrow" feint to patterns with one, two or more vertical lines, sometimes with a head-line with, possibly, the vowels printed at the head of the ruled columns. According to the size of the book, cuts are made inwards from the fore-edge and downwards to the bottom edge (from the end of the horizontal cut) to form steps or tabs along the fore-edge. The cuts from the fore-edge are always the same depth for each step, but the vertical cuts decrease in length progressively. Thus, on the first leaf a strip of paper, the width of the tab or step, and the full length of the fore-edge, less the depth of the first step, is cut away, and this "tab" lengthens with each new division of the index until the last leaf of the index is reached, where there is no cut at all. In this way the letters or numbers comprising the index appear on the "steps" and are all visible, down the length of the fore-edge, for ready reference.

This type of index can again be sub-divided as follows:—

Two-letter Index: An index consisting generally of 12 leaves with two letters stamped on each tab, X, Y, and Z being stamped on one leaf and I, or perhaps V, omitted.

One-letter Index: This is an index generally of 24 leaves. The letters seldom used—I, V, X, Y and Z—are dealt with specially. Sometimes the 26 letters are all shown by the device of stamping some leaves with two letters, and sometimes two letters are completely omitted.

Two-leaf-to-letter Index: Similar to the preceding type of index, this is one with two leaves to each letter, except in the case of the letters mentioned above, which may have only one leaf each or one leaf between two of them. Many mistakes have been made by confusing the terms "two-letter index" and "two-leaf-to-a-letter index," and it is important to be able to distinguish between them.

INDEX SCALE—LEAVES PER LETTER FOR DIFFERENT THICKNESSES OF BOOKS

THICKNESS OF BOOK IN LEAVES	50	100	150	200	250	300	350	400	450	500
Letter										
A	2	4	6	7	9	11	13	14	16	18
B	5	10	16	21	26	32	37	42	47	52
C	4	9	13	17	21	26	30	34	39	43
D	2	4	6	8	10	13	15	17	19	21
E	1	3	4	5	7	8	9	11	12	14
F	2	4	6	8	10	11	13	15	17	19
G	2	5	8	11	13	16	19	21	24	26
H	4	8	12	17	21	25	30	34	38	42
I	1	1	1	2	2	2	2	3	3	4
J	1	2	4	5	6	7	8	10	11	12
K	1	2	4	5	7	8	9	10	11	12
L	2	5	7	10	12	14	17	19	22	24
M	4	7	11	14	18	22	26	29	33	36
Mc	1	1	1	1	1	1	1	2	2	2
N	1	2	3	4	5	6	7	8	9	10
O	1	1	1	2	2	3	3	4	4	5
P	2	5	8	11	13	16	19	22	25	27
Q	1	1	1	1	1	1	1	1	1	1
R	2	5	7	9	12	14	16	18	20	23
S	4	9	13	18	22	27	32	36	41	45
T	2	3	5	7	9	11	13	15	16	18
U/V	1	1	1	1	2	2	3	3	4	5
W	3	7	11	15	19	22	25	29	33	37
X/Z	1	1	1	1	2	2	2	3	3	4
Total ..	50	100	150	200	250	300	350	400	450	500

With foolscap folios and smaller sizes, a two-letter index is given in books up to five quires or 500 pages, and a one-letter index is usual in books above this thickness.

In demy folios, a two-letter index is given up to five quires or 500 pages, and a one-letter index for thicker books.

In medium and royal folios, a two-letter index is given up to four quires or 400 pages, and a one-letter index for thicker books.

Indexed Through: This term means that the index is cut to embrace all the leaves of the book.

These are generally cut through to a standard scale, based on the ratios of the occurrence of names beginning with one letter compared with those beginning with the rest of the letters in the alphabet. Books intended for use in Scotland, for example, will always have a tab lettered "MAC" or "Mc" following the "M" tab; indeed, the practice of including "Mc" in index scales is now very widespread, the number of leaves allotted to "M" being correspondingly reduced.

Projecting Tab Indexes

These are almost invariably used for indexing right through a book, and are found more often in loose leaf than in fast bound books. The tabs take many forms, and need not all be described; mention is made here of the leather tab type lettered alphabetically or numerically in gold, the manilla tap type printed in black or white, and the vellum tab type turned over on manilla and stamped in black. Frequently these tabs are much longer than the fore-edge cut "steps" and may have a word or title stamped on them. They are usually lettered on both sides, which means that a person wanting to refer to another section need not turn back all the leaves to look for a particular tab. The tabs are usually double—*i.e.*, folded over on themselves from their own fore-edge, with the material cut large enough to allow them to be glued to both sides of the leaf. Their attachment to the leaf is generally strengthened by larger white linen pieces, called shields, being glued on both sides of the leaf. The "squares" on the edge of the book, where these tabs are fitted, are made larger to serve as a protection. Tabs, perhaps more often than fore-edge cuts, are necessarily formed into more than one "flight of steps" along the edge, because their size or number often renders it impossible to arrange for all to be seen at one viewing. Projecting tabs are subject to more wear, and they cause greater strain on the leaves to which they are affixed, than fore-edge steps. This is in no small measure due to the unfortunate practice, which is much to be deprecated, of using the tabs to turn over the leaves: the assistant should avoid this sort of thing and advise his customer against it.

Ruled or Ruled and Printed Indexes

These are very simple indexes for reference purposes, chiefly found in cheap duplicate or multi-copy books, fitted inside the front cover. Perhaps the commonest form is ruled narrow feint, with squares formed by vertical lines. To each square is allotted a letter (sometimes two or three) of the alphabet, and so the matter in the book can be indicated, although these squares allow but a brief reference to the subject and the number of the page on which it will be found. Within their sphere, however, these indexes may be said to be adequate.

Index—Miscellaneous Items

Index (or Letters) Backed: It will be realized that the "steps" or tabs are subject to heavy and sometimes illegitimate wear, with the result that the "indicator" piece tends to tear off the leaf. Because of this the back of each tab, and the portion of the leaf immediately adjoining, are often backed with linen or cotton pieces to strengthen the paper and prevent tearing. Another method used to attempt this strengthening is to cover the steps on both sides with kraft paper tabs on which the letters are printed.

Index Backed all down or Letters and Fore-edge Backed: In actual practice, it has been found that the backing of the tabs or steps sometimes merely means that the tearing is transferred to another portion of the leaf. The index leaves of necessity receive much turning over, so that, apart from the actual tabs, the whole fore-edge is liable to be much worn and torn. Consequently, instead of merely backing the "step" and the immediate area, the backing material may be affixed from top to bottom of the cut leaves.

Vowelled Index: Mention has been made of indexes with ruled columns headed with the vowels, but these are not truly "vowelled" indexes. Large and thick books are likely to contain many names or items which need to be classified alphabetically in an index. Even when these items have been sorted into lists, each list containing names which all begin with the same letter, rapid reference may not be possible because of the very length of the lists. Accordingly, these books are likely to be provided with indexes wherein the more important letters, at least, will have several leaves cut to fall behind those tabs. Where the strip is cut from the fore-edge a new fore-edge is formed for part of the leaf's length. Back from this fore-edge new steps are cut (usually smaller in size) and these are stamped with the five vowels, A, E, I, O, U. Thus the long lists of names, mentioned above, are further divided. These vowel tabs or steps are not visible at first glance, as are the main (or first) letters of the index, and are seen only when the leaves before any one step are turned over—a point to be remembered when taking particulars of a specially made book.

Index Interleaved Blotting: This simply signifies that there is a leaf of thin blotting paper bound in between every two pages of the index (usually a front index). It is a refinement which is a great aid to neat indexing, but is not used very much these days.

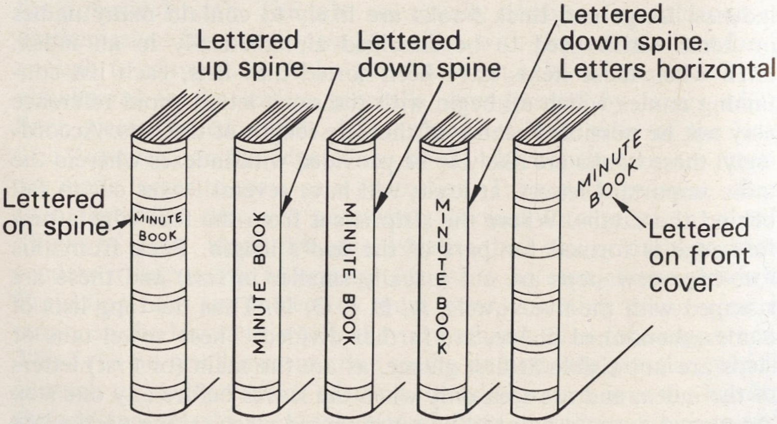
Numbering

It is most important to understand how account books are numbered. Some are paged and some are folioed. A page is a single surface of a leaf and a folio is the two pages—left-hand and right-hand—visible at an opening. Certain books are numbered on each page (1, 2, 3), whilst others are numbered by folio (1:1, 2:2, 3:3, 4:4)—that is, the two pages in each folio bear the identical number. Thus, a book with 250 folios is equivalent to one with 500 pages.

The distinction is not, as some may think, a purely arbitrary one, but relates to the way in which the book is used in book-keeping. Thus, where a transaction can be completed on a page, as in a day book or double ledger, the book is paged (1, 2, 3, etc.) Where both sides of the opening are complementary and necessary to the same transaction, the book is folioed (1.1, 2.2, 3.3, etc). Examples are to be found in cash books or double cash ledgers.

Lettering

This really is self-explanatory. Different books need different titles according to their use. The title is stamped either on the spine or the side, or both. Attention should be given to the ways in which titles may be lettered, as shown below. If the binding is in rough leather, or deeply grained, the lettering is usually on a "title piece" which is then itself pasted on to the binding.


Lettered up spine
Lettered down spine
Lettered down spine. Letters horizontal
Lettered on spine
MINUTE BOOK
MINUTE BOOK
MINUTE BOOK
M-I-N-U-T-E BOOK
MINUTE BOOK
Lettered on front cover

Lettering.

Indexing, Paging or Folioing, and Lettering

The standard practice in regard to the provision of indexes, paging or folioing, and the lettering of bound account and manuscript books is as follows:

Book	*Index*	*Numbering*	*Lettering*
Single Ledger	Indexed	Folioed	LEDGER
Single Cash Book	Not indexed	Folioed	CASH BOOK
Single Day Book	Not indexed	Paged	DAY BOOK
Double Cash Ledger or Journal Ledger	Indexed	Folioed	LEDGER
Double Cash Book ..	Not indexed	Folioed	CASH BOOK
Double Day Book.. ..	Not indexed	Paged	DAY BOOK
Treble Day Book	Not indexed	Paged	DAY BOOK
Journal	Not indexed	Paged	JOURNAL
Treble Cash Book ..	Not indexed	Folioed	CASH BOOK
Treble Day Book	Not indexed	Paged	DAY BOOK
Treble Ledger	Indexed	Folioed	LEDGER
Quad Cash Book	Not indexed	Folioed	CASH BOOK
Double Ledger	Indexed	Paged	LEDGER
Nettleton Ledger	Indexed	Paged	LEDGER
Double Cash Double Ledger, or Double Journal Ledger	Indexed	Paged	LEDGER
Minute Book	Indexed	Paged	MINUTE BOOK

8. Binding Materials

The skins of four animals—the calf, the goat, the sheep and the pig—produce the leathers used in account book binding, but it may be stated at once that practical knowledge alone will enable the qualities and characteristic features of the many kinds of account book leathers to be judged, and this knowledge can be gained only by careful and frequent examination and comparison of known qualities.

Perhaps the best method of dealing with this subject will be to divide the leathers into three classes—rough or nap-surfaced leathers, smooth-surfaced leathers, and grained leathers—followed by a description of other materials used.

Rough or Nap-surfaced Leathers

The name "rough calf" is probably the best known in this class, mainly because the term is often applied to all account book bindings having a nap surface, but such leathers as rough goat and rough basil are produced with the characteristic nap surface, and their appearance is very similar to that of the rough calf. Rough calf is simply the reverse side of the skin roughed up to produce the nap surface. Calf is pleasing to the eye and easy to handle, but its use for account book binding is not to be recommended, as the chemical preparation of the skin leads to rapid deterioration and decay. When compared with either the goat or basil, there is more firmness and more fibre about the calf nap, but it changes colour with wear and assumes a somewhat brownish tint. On the other hand, the rough goat is a harder leather than the basil, and this may be tested by pressing the thumb-nail into the leather.

Smooth-surfaced Leathers

Under the classification of smooth leather, basil, which is the product of the sheepskin, may be placed first because of its great popularity for account book work. It is cheap, yet strong and durable, and is produced in a variety of colours, buff, maroon and green being chiefly employed for account books. Smooth calf and basil are frequently confused, but the grain in the basil is coarser and the leather harsher than the calf. Colouring is produced by the use of aniline dyes.

Many account books which are said to be half bound sheepskin are in reality bound in skiver. In such an instance the designation is incorrect, for, whereas sheepskin is understood to indicate an entire leather, "skiver" is merely a split sheepskin, and therefore but half the thickness.

Grained Leathers

Although morocco leathers are not very largely used for account book binding, it is necessary to include them here, as they are the chief among the grained leathers. Real moroccos are goatskins, and the finest skins are obtained from the Levant and Cape goats.

One of the most beautiful varieties is known as Levant morocco, and the characteristics of this leather are the large irregular grain and the hard surface. But the usual, or rather the typical, morocco has a small grain, and there is a lustre about it which no imitation ever attains. Hard-grained goat, another morocco, has the small grain of the typical morocco, but a hard surface more akin to the Levant. Persian goat or Persian morocco is an inferior morocco leather, often produced with a large grain to imitate the Levant, but the surface is dull. Any dull-surfaced leather offered as a real morocco should be examined with suspicion.

Basils and skivers can be mechanically embossed with a variety of grains in imitation of real moroccos, but their detection is easy when the characteristics of pure morocco are kept in mind.

In the case of basils the grain is sometimes worked up with chemical treatment, and naturally this has an adverse effect on the durability of the leather.

Pigskin, although left until the last, is a leather of strongest character, and combined with its toughness and durability it has a pleasing appearance. The characteristic feature of a pigskin is the irregular grain and the innumerable pin-hole marks which correspond with the bristles in the original hide. Imitation pigskins are easy to detect, although they may be complete with bristle marks. In the imitation leather these pores will close up if soaked in water, whereas the pores on the genuine skin are not affected. Further, the "pin-holes" on genuine hide are always at the joints or junctions of the lines of the grain, whereas on the imitation they appear to fall anywhere.

Sundry Materials

Besides the leathers already named there are many other leathers and materials used in account book binding, and these may be briefly described as vellum, forel (or forril), cloth, buckram, and various leather substitutes such as rexine, pluviusin and pegamoid.

Vellum is prepared from the inside layer of calf and kid skins, and it is extremely strong and durable, used only for binding bulky and heavy books which have to withstand much heavy usage.

Forels are split sheepskins and vary to a great extent; some are fairly thick, whilst others are no thicker than paper. They are used for small commercial books, tradesmen's passbooks, etc., but are being replaced by cloth made to look like forel which is known as "vellum cloth." This is quite as durable, and a good deal cheaper than the real forel. If there is any doubt as to whether a book covering is vellum or forel, the class of book will frequently indicate the binding material, as forels are rarely used on large, heavy books, and vellum is not a suitable covering for small books, as it is much too heavy a material for such work.

Leather Substitutes

Leather substitutes are now widely employed for bookbinding purposes. Many of them, such as leathercloth and plastic-base materials, present a very smart appearance, and they are often mistaken for real leathers.

Leather-bound books, however, may be readily distinguished from books bound in leather substitutes as the leather will always feel warm to the touch, whereas the imitation will strike cold.

Most leather substitutes consist of a fabric base with a composition worked up into a variety of grains to imitate various leathers. In this group plastic-base materials are being more and more widely used.

Bookbinding Cloths

There are many classes of bookbinding cloths, but strength is the main feature of a good cloth. Generally made from cotton, it is obtainable in different designs and finishes.

Buckram is a stronger material than ordinary binders' cloth, and, whereas book cloths are generally made from cotton, buckrams are mainly manufactured from flax.

There are four qualities of buckram:

(1) The cheapest, and least superior to ordinary book cloth, is simply called "cotton buckram."

(2) The next quality, still made only of cotton, but decidedly stronger and harder-wearing, is known as "double warp cotton buckram." This is the quality frequently specified by Her Majesty's Stationery Office for various half bound books used by Government departments.

(3) Better still is the quality composed of a cotton and linen mixture and called "union buckram." This quality is not met with as often as the other qualities, perhaps because, although it is a strong material, it is not as cheap as the first two qualities, with the result that makers generally feel that they might just as well use the real linen buckram.

(4) The genuine "linen buckram" made from flax, is strong, very durable, and as hard-wearing as some leathers.

Compared with the rather coarse appearance of genuine linen buckram, the cotton buckrams are smoother, and have a more even surface.

Cloth Substitutes

In frequent use as a substitute for book cloth is paper of a strong finish and specially treated (impregnated). This is obtainable in different colours and finishes similar to those of the cloths, and once it is glued to boards it is easy to mistake it for the real cloth. It is extremely hard-wearing and is frequently used for quarter bound books.

9. Other Methods of Manufacture

Whip-Stitched Books

While the foregoing methods of binding have the sheets folded into sections for sewing, there are many classes of commercial books, such as some quarter bound books, duplicate books, triplicate books, telegram books, printed order books, receipt books, etc., which are bound in single sheets. When the sheets are to be whip-stitched, the leaves are knocked flush at the back, glued up, and put under pressure until they are dry.

The next stage is to divide them into sections with a given number of leaves, and each section is then whip-stitched. The required number of sections for a book are sewn on to tapes in the same manner as previously described, but if the book is very thin the tapes are not used.

Stabbed Books

With thread stabbing, the sheets are knocked up to the back edge, and holes are punched by hand or with a treadle machine about a quarter of an inch from the edge. Subsequently thread is passed through these holes and fastened off with a knot.

In the case of wire-stabbing, the sheets are knocked flush at the back and glued, and staples are driven through the leaves. When board covers are required, it is usual to staple through a narrow strip of board, placed back and front, on which the cover can be hinged to facilitate opening. The binding is completed in the same manner as other quarter bindings.

The advantage with wire-stabbing for certain classes of books is the greater accuracy in the register, a very important feature in such items as duplicate and triplicate books. Wire-stabbing must not be confused with wire-stitching. In the former the staples are used to secure single or flat sheets, whereas wire-stitching is performed through the ridge of a section of folded sheets (see wire-stitched books).

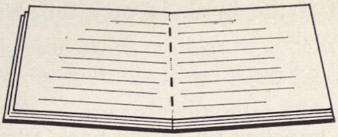
Thermoplastic Binding

This style of binding is an entirely mechanized method of securing single sheets. The sheets of the book, together with any cover boards, are knocked flush at the back and fed into the machine, where the back is cut, giving a rough, uneven surface. This surface is then impregnated by spray with a polyvinyl cold emulsion synthetic glue. A strengthening back strip of linen, mull or other suitable material, which has already been glued, is followed by the glued backing cloth, which is turned in over the sides. The books are then cut off in the appropriate length and heat is applied to the spine to cause the glue to set. This method provides a reasonably strong book which has the advantage of opening flat throughout. An added feature is the smooth straight spine, which shows no sewing or stitching marks.

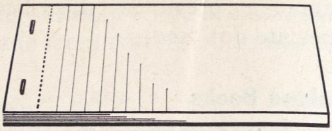
To a large extent this method has superseded stabbing and is particularly suitable for duplicate and triplicate books, and sometimes for quarter bound flush books.

Spiral Binding

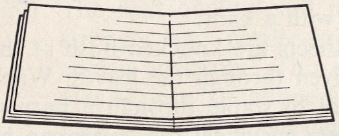
Several classes of books, such as reporters' notebooks and students' exercise books, are now spiral-bound in single sheets, and in many binderies are produced complete from reels of plain paper. The machine rules, cuts, counts, and stacks the sheets to the required



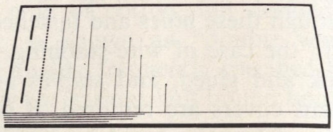
WIRE STITCHING



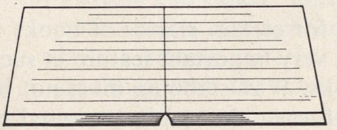
WIRE STABBING



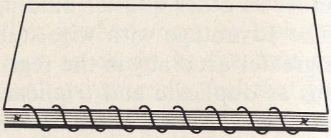
THREAD STITCHING



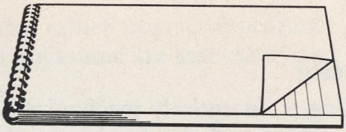
THREAD STABBING



THERMOPLASTIC BINDING



WHIP STITCHING



SPIRAL BINDING

number, when they are fed on to a conveyor to be trimmed, knocked up and punched to receive the spiral binding.

Another unit selects alternately the covers and backs of the books and passes them to a conveyor where they are trimmed and punched. At the junction of the two conveyors, the sheets and covers are assembled in correct order, and they then pass on to the binding unit, where the coil of wire is inserted from a continuous coil. The wire is trimmed off and tucked in and the completed books are delivered to a table at the end of the machine.

Alternatively, instead of wire, preformed strips of plastic can be used.

Stitched Books

It is now time to consider the last type of binding. Generally, this is a class of work used chiefly for cheap memorandum and exercise books which do not contain so many leaves as other classes of books already dealt with.

Thread Stitched: Books which consist of one folded section only, wherein the leaves are fastened together with thread, are known as "thread stitched." The stitching process may be carried out by hand or machine, but in either case the thread passes through the fold of the section and is fastened with a knot. There are some "specials" made by hand stitching which are comparatively strongly bound, having regard to the small number of leaves they contain.

Hand work is accomplished with one piece of single thread, which passes through the fold near the head and tail, being finally brought out into the middle of the fold through a centre hole, where the thread is tied off.

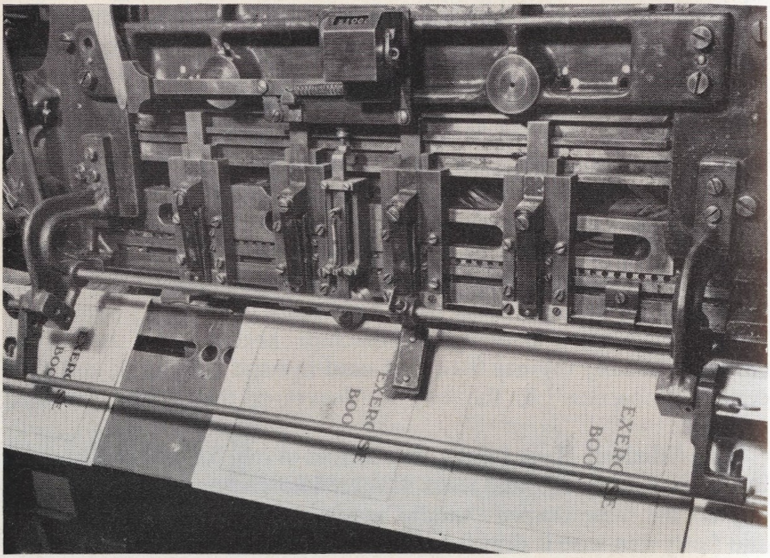
On a thread stitching machine, the section is laid on a "saddle" shaped like an inverted V, two or three needles pierce the paper, pick up the thread and draw it through the holes, after which a knot is formed and the thread cut off. Machine stitches are 2, 3, or 4 in. in length and therefore, in books which are longer than 7 in. in depth, two stitches may be used. These stitches are independent of each other. Machine stitching may be recognized by the different form of knot used for "tying off"; by the size of the holes (which are much larger when punched by machine needles); by the thread (which is usually thinner than that used in hand stitching); and by a certain "looseness" in the way the leaves of the section are held together.

Wire Stitched: These books also consist of one folded section only, but the stitching material used is wire. The section to be stitched is laid on the same shaped "saddle" as in a thread stitching machine, and fairly fine wire is drawn by means of small geared wheels from a reel into a groove where a "cutter" cuts off an appropriate length of wire, which is then bent into a U-shaped staple. This staple is driven through the fold: the mouth of the machine closes and forms a hammer which drives the staple firmly home and turns over the ends of the legs of the U, which are thus clenched down on the inside crease of the fold. One or more staples are inserted according to the size and thickness of the book. Perhaps wire stitching holds the section more tightly than thread stitching; certainly it does in comparison with machine thread stitching.

The wire used is of various gauges to suit the thickness and character of the work required to be stitched. "Round" wire is circular in section; "flat" wire is rectangular or oval in section. Steel wire stands up best to the pressure that is required to force the staple through the paper, but softer "rustless" wire may be used in an effort to prevent the staples from rusting while the book is in use. "Coppered" wire is also used for the same purpose.

No particular kind of cover is indicated by the terms "wire" or "thread stitched." The simplest and cheapest way to cover stitched books is to fold a manilla, pressing, or other stout paper cover round the outside of the section, and to stitch the whole lot together. The better-covered stitched work is dealt with in a variety of ways, which are described later in this section.

Stitching machines can operate very rapidly, particularly wire stitching machines. At one time the output of these machines was limited to the pace at which the operator could "lay on" the sections, but now the machines are made with what amounts to a very much elongated saddle for laying on the sections. Operators sit at "stations" along this extension and the sections which they feed to the machine are automatically conveyed to the stitching head, so that the actual stitching proceeds at the full speed at which the machine can operate and a very large output is obtained.



Wire Stitching.

However, modern machines are now capable of producing stitched books direct from the reel, incorporating, in one machine, ruling units capable of ruling both sides both ways in one operation, cutting and collating units, multiple wire stitching heads, a folding unit and cutting and trimming units.

The method of ruling is similar to the engraved roller method already described and may involve one or two reels as necessary. As the web is cut, printed or plain covers are collated automatically with the ruled sheets, which then travel forward to be knocked up, stitched, folded and finally trimmed. The advantage lies in the very high speeds which can be attained and the elimination of many individual operations.

Covering Stitched Books

(1) Stitched and Covered Cut Flush (Limp): This is a process of covering stitched books by drawing on a covering material (*e.g.*, cloth or rexine) over the back of the fold on to the end leaves of the book. The edges of the book are trimmed after covering.

(2) Stitched and Covered Turned In (Limp): Here the covering material is drawn on in a similar manner to that described above, but, after the three edges of the book have been trimmed, and then turned in over all the edges, the leaves at the front and back, which have now become end leaves (the cover material was drawn on to the original end leaves), are then pasted on to the covers.

(3) Stitched and Covered, Stiff, Cut Flush: This covering process is similar to (1) except that a stiffening medium (*e.g.*, a piece of thin strawboard) is first glued and affixed to the end leaves; the covering material is then drawn over this stiffener and the book is trimmed.

(4) Stitched and Covered, Stiff, Turned In: This process is similar to (2), but a stiffener as in (3) is first affixed.

It should be noted that many variations of the above processes are carried out for purposes of strengthening the covering or for refinement. Naturally it is of little use to prepare a strong or elaborate cover if the leaves of the book are of soft, weak paper, for in such a case the section would pull out, away from the end leaves. The section may therefore be stitched together with a strong cartridge paper folded round as an outside sheet, so that the covering is affixed to good stout end leaves. This outer sheet may be further strengthened with a strip of cotton pasted down over the outside of its fold. "Turned in" covered books may have a plain folded sheet inserted inside the first and last leaves. One leaf of this end sheet is pasted down over the turned-in edges of the covering materials, and the other is lined up to the "new" first and last leaves of the book. A form of cover for stitched and covered stiff books, which has little to recommend it except, perhaps, cheapness, is that wherein a thin strawboard, lined white one side, is folded round the section and the whole stitched together. Afterwards the covering material is drawn over all this board. The idea, of course, is to provide a book with a stiff cover, at less manufacturing cost, by cutting out one covering operation. These boards, however, are always brittle to some degree, so that they tend to crack down the fold; furthermore, they do not fit snugly over the fold of the section, with the result that the stitches pull through the cracked boards and the leaves drop out of the cover in a complete unit.

Stitched books may also be cased. Separate cases are made (as in sewn work) and the stitched section is fitted in the cover (or case) by fastening the end leaves down to the insides of the case. These cases may be made with small squares.

10. Making Up Special Books

When books have to be made to order, the following notes cover the information it is necessary to obtain:

(1) **Paper:** Size, quality, weight, colour, and name of watermark (if any), and number of leaves.

(2) **Ruling:** Whether the pattern extends over one page or a folio; if the vertical lines are run-through, stop-head or box-head; the number and width of feint lines; and the colour of ink for rulings.

(3) **Printing:** All words should be carefully checked with customer's pattern and written in block letters.

(4) **Binding:** If full, half, or quarter bound; material to be used; cloth or paper sides; lettering on spine or side; if not section-sewn, method of binding.

(5) **Numbering:** Thickness: if paged or folioed (two pages equal one folio). In some cases folio numbers are on one page only, and in this case it should be ascertained whether it is to be on the left or right.

(6) **Index:** Fast or loose—*i.e.*, bound in with the book or as a separate item; ruling vowel or plain; if one or two letters to a leaf; whether extra leaves for some letters; if to be backed with cloth or leather. In the case of loose index, style of binding, and lettering required.

(7) **Lettering:** Whether on spine and/or side. If direct on to the material, or whether a different title piece; size and position.

(8) **Extras:** Brass feet and corners; locks; loose covers. Where locks are required they must be specified correctly. Most fore-edge locks are made of brass and are fitted by rivets to the front and back boards. They fall into three main classes, which are:

(*a*) *Common:* An inexpensive lock which is almost flush with the front edges of the boards.

(*b*) *Bramah:* This type may usually be recognized easily by the projecting nozzle. It is much more expensive and may be made in many variations, to avoid the possibility of an unauthorized person possessing a key which will pass the wards. There is a "flush-type" Bramah lock, but it is always possible to recognize the Bramah type by the unique form of the key and by the fact that the key must be pressed into the keyhole against the pressure of a spring before it can be turned.

(*c*) *Lever:* This type may have two, three or four levers. Even if the word is not stamped on the outside, this lock may be distinguished from the "common" type by the greater depth of the body which contains the wards and levers.

Loose covers are usually made of a coarse, thick canvas, near white in colour, known as cotton duck. It is not necessary to make any measurements of them since they must, of course, fit the book. All that is required is to note whether the cover itself is to be lettered in black, or whether it is to be cut away at the back to expose the lettering of the book.

Brass feet and corners are sometimes required as additional reinforcement if the book is likely to be subject to heavy wear.

(9) **Delivery:** Promises for delivery should not be made unless it is certain that the obligation in this respect can be fulfilled.

Taking a "Rubbing"

The required details for a special book having been obtained, a rubbing should be taken of the lettering, and the only materials necessary for this are a sheet of printing demy or double crown paper, say, 19 lb. per ream (if too thick a paper is used it is not possible to get a good rubbing), a pencil, and a piece of heel ball or soft black crayon. This method is as follows:

The back or spine of the book is placed in the centre of the sheet of demy and the left half is drawn tightly round the book, the edge of the paper being turned over the fore-edge of the cover and between the cover and end-papers. This process is repeated with the right half sheet over the right-hand cover, thus covering the book entirely with the paper. It is important that there should be no movement of the paper while the rubbing is being taken. The heel ball or soft crayon is next rubbed firmly up and down the back, over the sides, and along the edges of the boards, back and front. This rubbing, if carried out properly, will give the exact size of the book and the position and style of any tooling or lettering—in fact, details which will enable the binder to reproduce a perfect replica of the original book.

The taking of the complete details by the method described above should occupy only a short time, and all that remains is for a fair copy to be prepared to accompany the order when forwarded to the works.

Taking a Pattern Ruling

The book from which the ruling pattern is to be taken should be opened, and the top edge of the sheet of paper placed level with the top edge of the page, but about one-quarter of an inch away from the fore-edge. On the left edge of the paper, the position of the head-line and the width of the first six feint lines are then marked with pencil, taking care to indicate any heavy feints. Afterwards, while the paper is still in position, a bold mark should be made on the copy where the bottom of the page ends. This will give the depth of the page. Now the left edge of the copy should be placed in line with the left fore-edge of the book, but with the paper drawn lower so that the top edge of the copy is slightly below the heading. This will enable the position of the downlines to be marked along the top edge of the copy. Finally, on the right, a bold mark is made where the width of the page ends (*i.e.*, where sewn, in the centre of the book), taking care that the copy sheet lies flat on the page where the round of the back dips into the fold. If the sheet is pulled taut and level across the width, the page will be marked a trifle too short. If some of the lines are red and some blue, this should be noted by writing R. or B. near the marked positions of the respective lines. Should the book from which the copy is being taken be ruled with a box-head, and printed, a rough copy should be made from which to prepare a fair copy for inclusion in the final copy to accompany the order to the works, about which more will be explained.

Patterns with box-headings will have the vertical lines stopped in at least two places and possibly three or even four. These patterns may be quickly noted with accuracy without relying upon memory if the following plan is adopted:

Vertical lines which stop at the bottom horizontal rule of the box are marked T.

Those which stop at a rule one-third of the distance up in the box, thus $\bar{\mathrm{T}}$.

Those stopping two-thirds of the way up, so $\overset{=}{\mathrm{T}}$.

Finally, those which stop at the top rule of the box are marked $\overset{\equiv}{\mathrm{T}}$.

The exact position of these sub-head rules within the box will be marked by drawing the left edge of the copy sheet along the page until sufficient of them are exposed for their location to be marked between the top and bottom box rules.

Ordering

The following is suggested as a useful routine when writing an account book order to send to the manufacturer after all the information as to a customer's order has been obtained:—

(1) Quantity.
(2) Name of book.
(3) Size.
(4) Thickness.
(5) Paper.
(6) Ruling.
(7) Printing.
(8) Type and style of binding.
(9) Indexing.
(10) Numbering.
(11) Lettering.

(12) Extras.
(13) Proofs.
(14) Price and delivery.

11. Duplicate Books

A duplicate book is a specialized type of book which requires separate consideration. It may be described as one in which is bound any required number of duplicate sets of forms (usually 100), each set comprising an original, perforated for ready detachment, and a duplicate or copy bound fast to remain in the book as a record.

The required copy is obtained by the use of pen or pencil, carbon paper being placed between the original and duplicate leaves during the process of writing.

Manufacture

As a general rule, duplicate books require for their production highly specialized, multi-operation plant of the rotary or semi-rotary type, and for that reason the manufacture of them was limited, at one time, to a few large specialist firms selling direct to consumers. Now, however, there are several trade houses from which the stationer can obtain duplicate books of all kinds, at prices that will enable him to compete successfully.

Classification

Duplicate books are divided roughly into five classes.

Stock Patterns: These have the original leaf ruled feint only or ruled feint with a stock printed heading—*e.g.*, order book, invoice book, delivery book, etc.

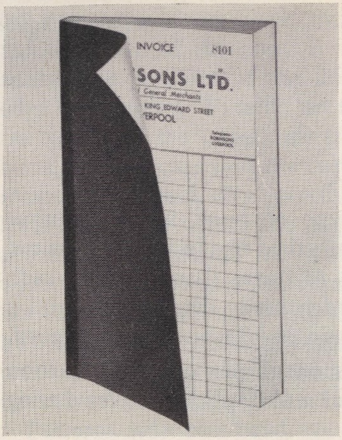
Both original and duplicate leaves are numbered to agree, in order to facilitate reference and to ensure that every transaction is accounted for.

Bank paper is used in the manufacture of these books because, being light in weight, it ensures a good carbon copy being obtained, whilst it is of sufficient strength to withstand hard usage.

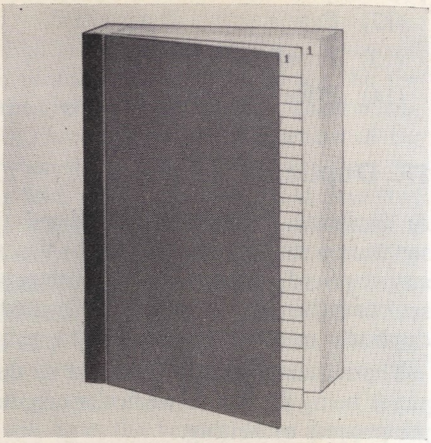
Usual bindings are (*a*) quarter cloth, stiff board covers flush, (*b*) quarter cloth, manilla covers flush. Both may be stabbed or thermoplastic bound.

Carbon of a quality suitable for the purpose for which it is intended—*i.e.*, pen or pencil writing—should be supplied in each book.

These books are made in a wide variety of sizes, each containing 100 leaves in duplicate.



Specially Printed Duplicate Book.



Stock Duplicating Book.

Triplicate books are similar to duplicate books, with the exception that they have an additional leaf—that is to say, one original, perforated to tear out, one duplicate, perforated to tear out, and one leaf bound fast.

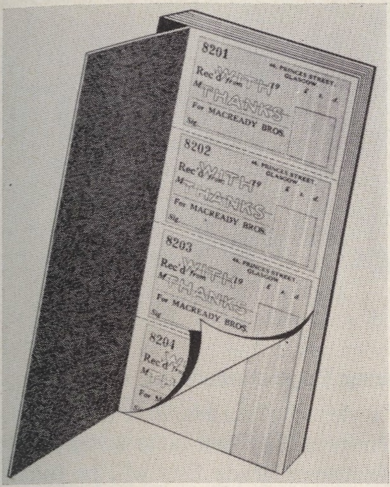
Specially Printed: This is the second class of duplicate books; the original leaf is printed specially to customers' individual requirements (name, address and other special matter exactly suiting any particular needs).

For obvious reasons, any firm of standing prefers to use orders, invoices, etc., printed with its own name and address, etc., rather than a stock form upon which this information has to be filled in, and that is why the demand for specially printed duplicate books so considerably exceeds that for the stock kinds.

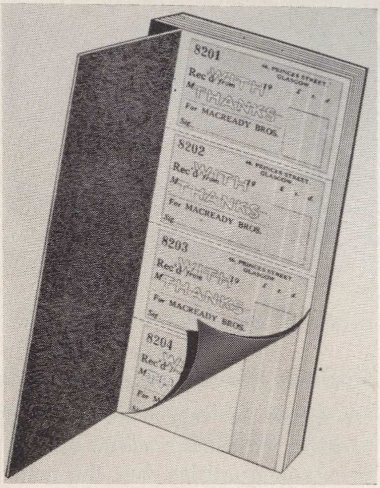
There is practically no limit to the variety of uses to which these specially printed duplicate books may be put, and the market is so wide as to offer tremendous scope for any stationer.

Carbonized Books: In this class of book, no loose carbon papers are necessary because each original or "first" leaf throughout the book carries its own carbon deposit on the back. (The books are fitted with a "stop" sheet to prevent "carboning" right through the book when an entry is made.) Carbonized duplicate books (especially when printed as cash receipt books) are ideal for collectors, travellers, etc., who have to work outdoors in wet and windy weather, and to whom the handling of loose carbon may be inconvenient.

Carbonless Books: The fourth class of duplicate book may be manufactured from a specially treated paper. This paper uses the principle of a reaction between two chemicals when subject to



Specially Printed Duplicate Cash Recept Book.



Specially Printed Carbonized Cash Receipt Book.

pressure, and requires a chemical coating known as C.B., on the back of the "first" leaf, and a coating of a second chemical known as C.F., on the front of the duplicate leaf. Any intermediate leaves, as in triplicate books, are coated with the appropriate chemicals on both front and back; this sheet is known as C.F.B. The pressure of writing on the first leaf will cause a reaction to take place between the two chemicals, which will leave a permanent blue mark on the duplicate leaf.

Counter Check and Bill Books: These are used by every retail shop and store. They are used in two styles:

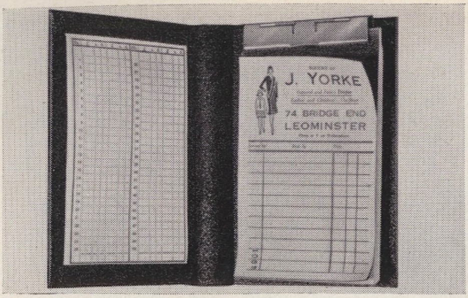
(*a*) *Cut edge books* very similar to those described above, but printed on cheaper-quality paper, usually M.G. printing, and bound in limp M.G. pressing covers.

(*b*) *Folded style*, in which original and duplicate are formed from the same sheet of paper, perforated at the stub and in the centre, and folded at the centre perforation to form in essence two leaves, held together at the perforation.

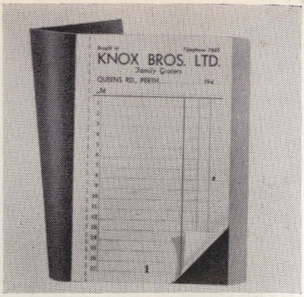
Uses

Common usages are for order books, memo books, invoice books, credit note books, delivery note books, cash receipt books, postcard books, butchers' ticket books, counter check, and bill books.

For these and many other uses, they have supplanted the old style of counterfoil books which involved writing out everything twice, with no guarantee that the counterfoil would agree with the original document.



Fold-Over Counter Check Book.



Cut Edge Bill Book.

Qualities, Sizes, and Special Ordering Requirements

Owing to the very wide range of styles and usages, it is impossible to give, within the scope of this chapter, any complete schedule of sizes and qualities, but the manufacturers' trade lists will be found to give every detail necessary to the successful and easy handling of this class of business.

In ordering, care is necessary to quote the manufacturers' correct reference, the quantity and price, and, in the case of specially printed books, to provide a clear, readable "copy," which should include numbering instructions. Thus, to use a fictitious reference, an order should be written as follows:

> 72 style XYZ duplicate cash receipt books printed in black to copy attached, and numbered 1001 and up, at 10s. each subject.

Invariably, the manufacturer's reference, *e.g.*, XYZ, will indicate all other relevant details, such as size, quality and binding, and it is unnecessary to repeat them on the order.

Sometimes, however, the specification will deviate from standard make-up and it is then essential to give full details as to the exact requirements.

These might be given as follows:

> Quantity, type and style of book, size, number of leaves and how many leaves to a set, quality and colour of paper, printing and ruling details, numbering and perforation, binding, carbons.

12. Books of an Ordinary Commercial Concern

Books of Account

In order to be able to sell account books intelligently the assistant should—without pretending in any way to be an accountant—have some idea of their various uses, and know the sort of books kept by an ordinary commercial concern.

The purpose of book-keeping is to have a permanent record of all business transactions and to show the effect of these transactions upon the financial position of the firm or person concerned. The modern system of book-keeping is known as "double entry," for it records the two aspects of every transaction. To give an example, in the purchase of furniture, money is paid out, so that the cash account is reduced, but in its place goods are bought, and the amount shown in the furniture account is accordingly increased. Thus, in every business transaction "giving" and "receiving," or "debit" and "credit," takes place between accounts in the same set of books. That, very briefly, is the theory of "double entry."

There is another system known as "single entry," but this is not recognized today, for it has many deficiencies and keeps only personal accounts, so that it does not provide a complete record.

The Ledger is the principal book. The word "ledger" is derived from the old Dutch *legger*, from *leggen*, which means "to lie." The whole of a trader's transactions is entered in total from the subsidiary books into the ledger accounts where it "lies," as it were, for ready reference.

Every business, then, needs a ledger. This summarizes and classifies all the dealings that have taken place, and from it the balance sheet, which shows the trading results for a specified period of time, can be prepared.

A concern usually splits the ledger into three separate books:

(*a*) *The Purchase Ledger*, in which are recorded the transactions with suppliers of goods;

(*b*) *The Sales Ledger*, in which are recorded the transactions with customers;

(*c*) *The Nominal Ledger* (or *Private Ledger*), in which are recorded the details of the individual items shown in the profit and loss account and balance sheet.

The Cash Book is the next most important book. It is what is known as "a book of original entry," and in it all receipts and payments of money—as distinct from credit transactions—are recorded. It is, in fact, part of the principal book—*i.e.*, the ledger—for it comprises actually the cash and bank accounts taken out of the ledger and bound separately for the sake of convenience.

A Petty Cash Book is necessary if the cash transactions are at all considerable, in order to relieve the general cash book of much cumbersome detail. It is used for recording the many small or "petty" disbursements incidental to modern businesses.

Then, according to the nature of the trading carried on, and the volume of it, some or all of the following books will be required:

(*a*) **Purchases Book**, in which are entered all goods bought on credit. It is also variously called the "bought book" or the "bought day book" or the "invoice book" as it is written up from the invoices received from creditors.

(*b*) **Sales Book**, in which are entered all goods sold on credit. It is also known as the "day book" or the "sold day book" or the "sales day book."

(*c*) **Purchase Returns Book**, also known as the "returns outward book," or "debit book." This records all returns of goods bought—*i.e.*, goods returned as damaged, or not up to sample, or because they are not of the right kind.

(*d*) **Sales Returns Book**, also known as the "returns inwards book," or "credit book." This records all returns of goods sold.

(*e*) **Bill Books**, comprising the bills receivable book and the bills payable book, in which are recorded all bills of exchange, drawn, received, and accepted by the firm.

Originally it was the practice to enter all transactions into a **Journal**, but this was soon found to be cumbersome and tedious. The journal has now come to be largely superseded by the books referred to above, though it still has its uses. In modern counting-houses the journal is often used to record all those entries which cannot conveniently be made in any of the other books, or which are insufficient to necessitate the use of a separate book.

Statutory Books

Under the Companies Act 1948 (which consolidated the Acts of 1929 and 1947), a company registered under the Companies Acts is required to keep the following statutory books:

(1) Register of members (or share ledger).

(2) Register of directors and secretaries.

(3) Register of mortgages and charges.

(4) Minute books.

To these must be added the following additional statutory books required under the Companies Act 1967 to be kept by a company registered under the Companies Acts:—

(5) Register of Directors' Share and Debenture Interests.

(6) Register of Interests in Share Capital (where any part of the share capital is quoted on a stock exchange).

Most of these books have printed headings.

Although the Act of 1948 does not insist that a register of debenture holders shall be kept, it is usual for such a register to be maintained by a company that issues debentures or debenture stock.

Reference has to be made to the register of members more often probably than to any other statutory book, and every company having more than fifty members must, unless the register is in such form as to constitute in itself an index, keep an index (which may be in the form of a card index) of the names of its members.

In addition, it is provided that every company shall keep proper books of account with respect to (*a*) all sums of money received by the company, and the matters in respect of which the receipt and expenditure takes place; (*b*) all sales and purchases of goods by the company; and (*c*) the assets and liabilities of the company.

Besides these statutory books, other books or loose leaf binders or sheets are generally employed to record numerous details connected with business operations, such as the undermentioned:

(1) Applications and allotments.
(2) Calls and instalments.
(3) Share certificates.
(4) Register of transfers (sometimes used by private companies).
(5) Dividends.
(6) Seal register.
(7) Register of probates.
(8) Directors' attendance book.

Register of Members: This is ruled in tabular form, though there is no standard ruling as the law does not prescribe any particular pattern. It must contain:

(*a*) the names and addresses of members, together with a statement of their shareholding in the case of a company with a share capital;
(*b*) a statement of the amount paid, or agreed to be considered as paid, on the shares of each member;
(*c*) the date when each person was entered in the register as a member;
(*d*) the date when any person ceased to be a member.

Register of Directors and Secretaries: This is ruled in tabular form, but no special pattern is prescribed. It must contain the names, addresses, nationalities, occupations, and other particulars of the directors and secretary or secretaries of the company.

Register of Charges: Also in tabular form, the pattern of this register is not prescribed but may follow the ruling of Form No. 47 in the Companies (Forms) Order 1949 (S.I. 1949, No. 382). It must contain details of all charges specifically affecting the property of the company and all floating charges on the undertaking or any of the company's property, showing the amount secured by the charge, short particulars of the property charged, and the names of the persons entitled to the charge.

Register of Debenture Holders: This register is usually kept if there are debenture holders. It is ruled in tabular form, and records the names and addresses of the debenture holders, together with full details of their holdings.

Minute Books: The normal minute book ruling has already been described under Rulings. Every company is required to record the proceedings of its general meetings and of the meetings of its directors. Since shareholders have the right to inspect minutes of general meetings it is advisable to use a separate book for the minutes of meetings of directors.

Register of Directors' Share and Debenture Interests: This needs to be ruled in tabular form. No special pattern is prescribed, but the official Journal of the Chartered Institute of Secretaries suggests that it should contain columns for the following information:—

(*a*) The date of notification and of entry.
(*b*) The reference number of the entry.
(*c*) The title of the instrument.
(*d*) The nature of the contract or right.
(*e*) The date of purchase or sale, the date of a grant of a right or the exercise of a right or the date of a cessation of an interest.
(*f*) The consideration paid.
(*g*) The period during which the right can be exercised.
(*h*) The names in which it is registered or is to be registered.
(*i*) The consideration received on disposal.
(*j*) The balance held:
    (i) in the director's own name;
    (ii) in other names, which should be specified.

Register of Interests in Share Capital: This register, also to be ruled in tabular form, is required to be kept only by a company of which the whole or any part of its share capital is quoted on a recognized stock exchange. Again, no special ruling is prescribed, but the register should contain columns for the following information:

(*a*) The date of notification and of entry.
(*b*) The reference number of the entry.
(*c*) The name and address of the person having the interest.

(*d*) The nature of each interest and the number of shares in which each interest is held.

(*e*) The date of purchase or sale, the date of a grant of a right or the exercise of a right or the date of a cessation of an interest.

The register must be kept in alphabetical order (or a separate index must be maintained) and the entries inscribed in relation to each person having an interest must be in chronological order.

Record of Applications and Allotments: This is ruled in tabular form, but there is no prescribed pattern. It normally contains columns to record the names and addresses of all applicants for shares, the number of shares applied for and the amount deposited with each application. Additional columns are provided to record the number of shares actually allotted and their distinctive numbers (if any), the total amount due on application and on allotment, the balance due, and the amounts subsequently received. It is usual to keep separate books for each class of shares—ordinary, preference, deferred, etc.

Calls and Instalments: This is ruled in tabular form, but no standard ruling is specified. The record usually contains columns for the names and addresses of the shareholders, the number of shares held, the amount due from each shareholder in respect of the call or instalment, and the amounts actually paid. A separate record should be kept for each class of shares.

Share Certificates: These are made up on the lines of cheque books, containing certificates which are perforated so that each one has its counterfoil on which short particulars are entered for reference.

Register of Transfers: This is ruled in tabular form, but no special pattern is prescribed. It usually contains columns to record the names and addresses of both transferor and transferee, together with particulars of the shares transferred.

Record of Dividends: These are required, in tabular form of no specified pattern, in books or on loose leaf sheets at balancing time. There will be included the names of the shareholders, the amount paid up on the shares, the gross amount of dividend due, the tax deductible, and the net dividend payable. Separate books or sheets should be kept for the different classes of shares.

Seal Register: Every company must have a common seal upon which its name is engraved, and it is usual for this seal to be provided with one or more locks. The custody and use of the seal are matters which require strict caution, and normally a register is kept in which to enter particulars of documents to which the seal of the company is affixed. This should be ruled to contain a description of the document, the date of the resolution authorizing its sealing, and the names of those in whose presence the seal was affixed and who signed the document.

Register of Probates: Probate is the official evidence that the person or persons named is or are the executor(s) of the will of a deceased person, and letters of administration authorize the person(s) named to administer the estate of someone who has died without leaving a will. Large companies usually keep a register, ruled in tabular form but of no prescribed pattern, in which to record deceased shareholders' names, names and addresses of executors or administrators, date of death, date of probate, date of registration of probate, and other relevant details.

Directors' Attendance Book: This takes no special form. It is usually a quarto book ruled feint, with or without margin.

Combined Registers: In the case of large companies, the various registers will, unless kept in the form of loose leaf records, be ruled and bound specially as individual books, but there are innumerable small companies whose requirements do not necessitate separate books, and to satisfy their needs a Company Combined Register is produced, which includes in a single volume all the vital registers referred to above. It will not, of course, contain such things as the minute book or directors' attendance book.

This combined register is bound with an index in front and is provided with extending tabs on the fore-edge to denote the various sections and to facilitate reference. Its sections are not made to specific sizes in terms of quires or number of leaves, but depend upon the capacity of the register of members or share ledger, which is referred to as having capacity for so many "accounts" or "members." This will determine the proportionate size of the other sections.

A combined register is usually intended to cover a period of four, five, or seven years.

CHAPTER 9

Loose Leaf Books and Systems

1. Terms in General Use

Before considering the available loose leaf mechanisms or discussing uses of loose leaf binders in general, the student must be familiar with certain standard phrases, their precise meanings and importance. There are not many to bear in mind, and they are set out hereunder:—

Sheet Size: The size of the sheet of paper to be contained in the loose leaf binder.

All size references to loose leaf binders are made in terms of the sheet that they hold, and every manufacturer follows this rule unless his instructions clearly state otherwise. He will make his covers of a size to protect the contents fully. Sheets are always quoted giving the "binding side" first.

Binding Side: The side of the sheet on which the punch holes appear. Thus 13 in. × 11¼ in. describes an upright sheet punched on the 13 in. edge.

Overall Size: The actual size of the *covers* of a loose leaf binder, including the mechanism.

Index Allowance: The space allowed between the fore-edge of a sheet and the fore-edge of the binder into which the index tabs project.

Binding Margin: The space required between the back-edge of the sheet and the point at which writing can comfortably begin. It varies between ½ in. or rather less in ring binders to 3 in. for some heavier mechanisms.

Centre to Centre (C to C): The measurement that is used to describe the distance between punched holes in a sheet. Whatever the shape of the hole, the method of measurement is always the same—*i.e.*, from the outer edge of one outside hole to the inner edge of the other outside hole. See figure.

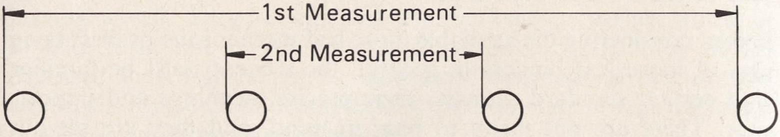
Where only *two* holes are punched there is, of course, only one measurement.

Where *three* holes are punched, the C to C of the *outer* two holes must be given, mentioning "one hole centre."

Where *four* holes are punched, the C to C of the outer holes should be given first and then that of the inner holes.

The "neck" is the distance between the back edge of the hole and the back edge of the sheet.

Where many holes are used down the full length of a sheet—as for a multiple ring binder—the centres between any two holes only should be given.



Centre to Centre Measurement for 4 Ring Mechanism.

It is always presumed that a group of punch holes is "centred" in the sheet—*i.e.*, the distance from the top of a sheet to the near edge of the top punch hole is the same as that from the bottom of the sheet to the near edge of the bottom punch hole. If this is not so, then a rough sketch showing the relevant measurements should be drawn.

A final note. Accuracy in the measurement of centre to centre is essential. A good ruler, accurate to at least 1/32 in., should be used.

2. Loose Leaf Mechanisms

A loose leaf book may be defined as a book having attached within its covers a holding mechanism which allows sheets to be inserted or removed at will. Thus the phrase "loose leaf" has become an all-embracing description for every type of paper-holding device in this field, despite the fact that in many cases the contents are as strongly held as in any conventional bound book.

It is customary to refer to such loose leaf books as "binders" rather than books, and this terminology will be used from now on. The loose leaf binder industry is at this time something over sixty years old. During that period a series of manufacturers has produced paper-holding mechanisms which have become standard. Through the years many of these, refined and improved from time to time, have made for themselves a permanent place in the overall loose leaf market.

These mechanisms may be grouped under seven main headings. They are:—

(1) The Thong mechanism.

(2) The Expanding, telescopic post steel back mechanism.

(3) The Slide bar, spring-operated fixed capacity mechanism with lifter bar.

(4) The Sectional post key-operated mechanism.

(5) The Ring mechanism.

(6) The Prong mechanism.

(7) Loose leaf fittings for catalogue binders, manuals etc.

Nearly all these main headings are capable of sub-division. For instance, the thong mechanism is available in both key-operated and "keyless" type. It should also be understood that individual manufacturers have built into the basic mechanisms certain improvements of their own. It is not the purpose of this handbook to detail the relative merits or demerits of such additions—the principle of operation is all that matters.

It may well be said that, while the invention of the loose leaf principle was in general a boon to the business world, the incorrect application of given mechanisms to particular requirements has proved a curse. Such misapplications are generally caused by a lack of understanding of the precise characteristics—and thus the capabilities—of each individual range of mechanisms.

It is well, therefore, to establish the point now that no loose leaf device is necessarily restricted to any one application and that the student's task is to study carefully the *characteristics* of every type of loose leaf mechanism and thus thoroughly understand the strengths and weaknesses present. The correct application of this knowledge to any particular set of requirements is the real secret behind every successful loose leaf installation.

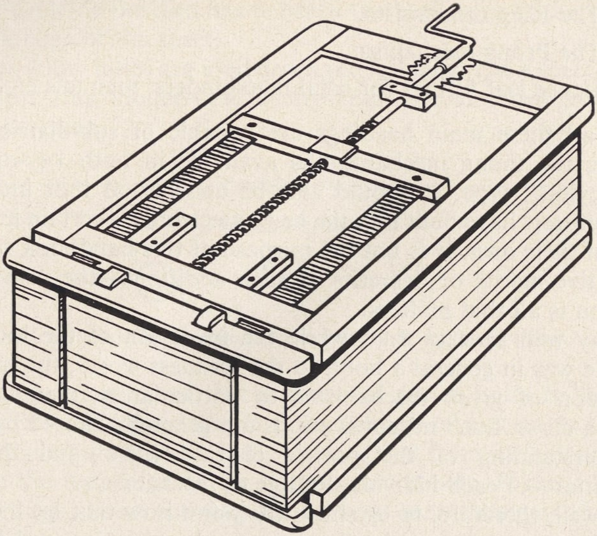
The individual loose leaf devices listed above will now be considered. They will be related to their most common uses, but it must not be forgotten that in each and every case the field of use is as wide as imagination and intelligent application can make it.

3. The Thong Binder

The thong binder is so named because the medium used to hold the front and back covers of the binder together is a series of two or more woven cotton or nylon straps commonly known as thongs.

This binder consists of two hollow covers constructed of wood or, alternatively, moulded from some other material. A metal bar, which may be tubular or solid, is hinged to each cover and is known as the clamping bar. The bar is pierced with a series of elongated holes through which pass the woven thongs holding the covers together.

The illustration above shows the hollow back cover of the binder in which the mechanism is housed. There is a threaded central rod, commonly called a driving rod, upon which is mounted a cross bar. The thongs themselves are riveted to this cross bar and pass from the back cover through the back and front clamping bars into the front cover where they are finally riveted into place. This procedure may



Thong Binder Showing Mechanism.

on occasion be varied in that the thongs are finally fixed within the front clamping bar instead of the front cover itself.

The threaded driving rod is held in position within the back cover as shown in the illustration and is formed at the outer end to receive a winding key. The key is pushed on to the end of the driving rod and, when turned anti-clockwise, causes the cross bar to move downwards towards the clamping bar, thus expelling the thongs from the back cover. A reverse movement—clockwise—pulls the thongs back into the cover.

Thus a variable amount of thong may be exposed between the front and back clamping bars to which sheets, by means of a punch hole similar to that illustrated above, may be attached.

Once the requisite sheets are attached to the thong, the clamping bars may be drawn against them by the action of winding the key in a clockwise direction. The tighter the key can be wound, the tighter the clamping bars will grip the sheets, thus holding them between the two covers.

It should be noted, however, that not all thong mechanisms employ a key. There are other ingenious methods by which this binder may be tightened upon its contents and held in the "gripping" position. Nevertheless, the general principles of this mechanism remain the same.

Because the clamping bars may be wound together until they touch, they will, if necessary, grip only one sheet of paper. From this point the binder can be expanded with complete flexibility to the maximum available length of thong which may be wound out of the back cover.

Once expelled from the back cover, the flexible thongs allow the operator easy access to any section of the contents by the simple process of pushing the sheets apart along the thongs at the spots required for inserting a new or extracting an old sheet.

Thong clamping bars are very narrow and lie with the covers close to the desk. Thus the sheets held between them are not lifted up from the surface of the desk by a spine as is the case with certain other types of binder. This results in less binding margin being required.

The thong mechanism consists of a few small components, none of any great weight. The covers themselves may be light in construction and, as the capacity is variable, the book may be closed down to the smallest possible number of sheets in use.

Two types of lock may be fitted to thong binders. Firstly, a mechanism lock operated from a keyhole inside the back cover. A shutter may be thrown across the top of the driving rod, thus preventing the insertion of a key and the unwinding of the mechanism. This lock does not, however, prevent anyone from inspecting the contents of the binder.

The second type of lock available consists of a steel-cored strap riveted to the back cover and positioned in such a way that, when bent round, it may be locked in a sliding lock which rides in a channel in the front cover. The keyhole of the binder is, at the same time, obscured. Thus it becomes impossible either to operate the mechanism or to look into the binder itself.

Characteristics and weaknesses

(1) It has a completely variable sheet capacity, from one sheet to its maximum holding power. This is often as many as 700 sheets.

(2) This binder is inefficient if filled with more than around 400 sheets, largely because the amount of flexible thong expelled after that point allows the front and back covers to swing on one another unless the binder is very carefully handled. Thus sheet alignment is badly disturbed, and the movement tends to cause sheets to break away at the punch holes.

(3) Where the width of sheet in use is twice the depth or more, a similar problem to that outlined above arises.

(4) Sheets can be inserted or extracted very easily to or from any position in the binder.

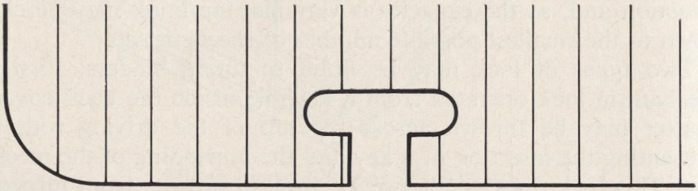
(5) It lies flatter, and its contents need less binding margin than many other types.

(6) It is comparatively light in weight.

(7) It can be used where security is a major consideration.

(8) Many thong binders not employing a key to operate the mechanism are likely to be inefficient over a capacity of approximately 200 sheets.

(9) Thong binders have no spine as such. Therefore, if any indication of the contents is needed on the spine, a label holder or an engraving on the clamping bars must be resorted to. Limp fold-in backs which may be blocked in gold have been made for thong binders, but these are not particularly good in use.



Thong Slot.

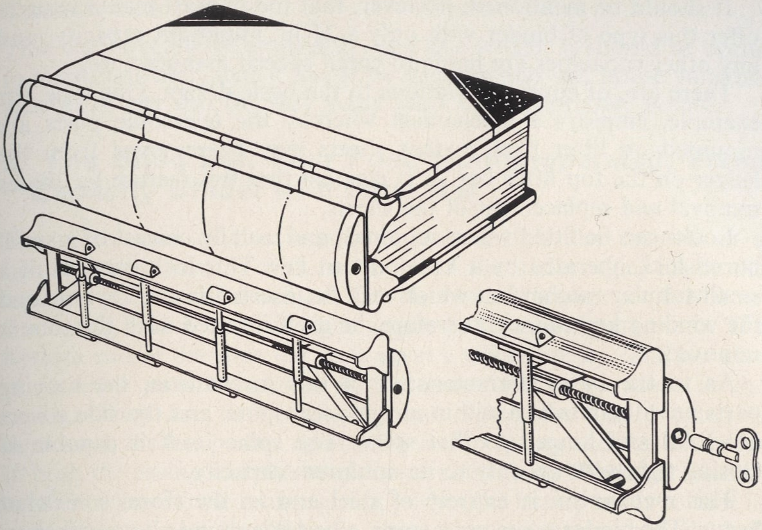
(10) The thong slot in the sheet can easily be maltreated by careless insertion or removal. If the little lugs of the slot are torn off, the sheet cannot be effectively retained on the thongs.

Common Uses

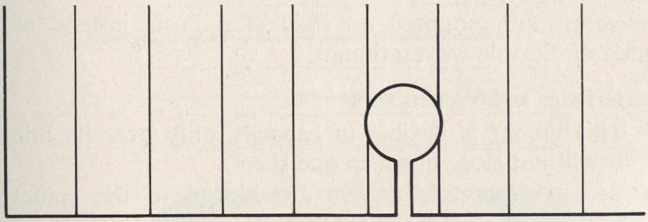
The most common use of the key-operated thong type binder is as a book of account, mainly as a ledger. It is equally suitable for use as a day book or cash book. It should always be considered for any records where flexibility of capacity, ease of insertion and removal of sheets, flat lying and lightness of weight are required.

4. The Expanding Telescopic Post Steel Back Binder

This type of loose leaf binder possesses a rounded back or spine normally formed from pressed steel, with a right- and left-hand threaded screw driving rod mounted inside it. To each end of the driving rod are attached movable arms linked to side members. A series of telescopic tubes is mounted at intervals along the side members and a winding key is provided to rotate the rod. The rotating rod alternatively pushes the arms apart or pulls them together. This in turn widens or narrows the gap between the side members. The sheets are punched with round slotted holes as shown in the illustration and may be pushed over the telescopic posts. It



Expanding Telescopic Post Steel Back Binder.



Slotted Hole.

follows, therefore, that, given enough sheets, the side members, when tightened up, will grip them as in a vice and, when opened out, will allow space for sheets to be removed or inserted. The diagram, which is a conventional design, clearly shows this simple mechanical movement. These mechanisms may be offered in any or all of three capacities. It can be seen that with this type of binder a minimum number of sheets must be inserted before a grip can be obtained and, in this respect, it differs markedly from the thong mechanism.

Common capacities for this type of mechanism are as follows:—

(1) $1\frac{1}{4}$ in., holding approximately 200 sheets minimum to 250 sheets maximum.

(2) $2\frac{1}{4}$ in., to hold 350 sheets minimum to 550 sheets maximum.

(3) 3 in., to hold 500 sheets minimum to 750 sheets maximum.

It should be mentioned, however, that today most manufacturers offer this type of binder with only a 2¼ in. minimum capacity, and any other capacities are liable to entail special manufacture.

There are, of course, variations to the basic design. One type, for example, employs a mechanism whereby the telescopic posts are mounted on lifter bars so that sheets may be removed from the ledger on the top lifter bar. It is claimed that this feature facilitates removal and replacement of the sheets.

Locks can be fitted where required, and usually consist of a small barrel lock operated by a Yale pattern key. This lock consists of a small tubular mechanism which may be inserted in the keyhole and the winding key cannot, therefore, be itself inserted until the tube is removed.

As to the basic characteristics of this mechanism, the moving parts are all contained within a rigid steel spine, and the side covers are solid and hinged to that spine. The spine itself is capable of closing tightly down only to its minimum capacity.

This mechanism is entirely of steel and is, therefore, somewhat heavy. The binder possesses a spine, albeit it is rounded; nevertheless, this spine lifts the sheets much higher from the desk than is the case with the thong type.

The sheets are mounted on rigid steel posts instead of being mounted on flexible woven thongs.

Characteristics and Weaknesses

(1) This binder is flexible in capacity only over its minimum. It will not close down to one sheet.

(2) Because the solid covers are hinged to the spine which contains the mechanism, there is never any tendency for a swinging movement of the covers at big capacities as is the case with the thong binder. This means that sheet alignment is generally good.

(3) Because of the spine, there is considerable bulge at the binding side of the sheet and, therefore, a binding margin of not less than 3 in. is the normal. Here it may be stated, however, that, if this binding margin is allowed, and because the rounded steel spine allows a rolling movement to take place when the cover is being written in, the actual writing surface in this binder is reasonably satisfactory.

(4) This mechanism possesses great strength and will normally have a life of many years.

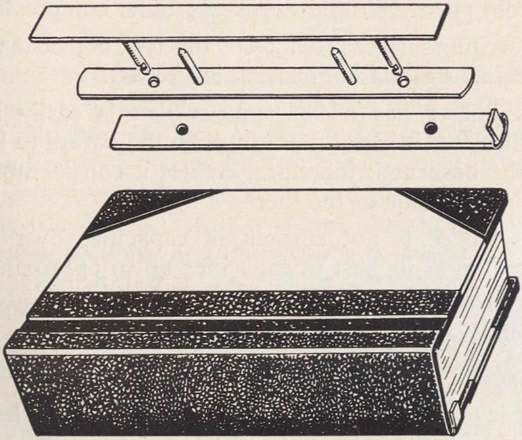
(5) Removal of sheets from this type of binder is not particularly difficult, but insertion may be so unless at least ¾ in. space is available for manually pushing the sheets over the steel posts. This obviously implies a loss in overall capacity if the binder is to be operated efficiently.

Common Uses

This binder is almost invariably used as a ledger. It should be borne in mind, however, that it has great strength and will house valuable records of any sort for very many years if appropriately bound.

5. The Slide Bar, Four Post, Spring-operated, Fixed Capacity Binder with Lifter Bar

The mechanism of this important loose leaf binder consists of a light top metal casing with two holes in the under edge. Inside the casing a slide bar is mounted. The top end of this bar projects from the casing and is bent at right angles to form a thumb-plate. The bottom end of the slide bar rests upon a return spring. The bar also is punched with two holes at the same centres as those in the casing. They are so positioned that, when the thumb-catch is depressed, the bar pushes against the return spring and the two holes in both the casing and the bar become coincident. When the thumb-catch is released, the return spring pushes the bar upwards so that in a position of rest the holes in the casing are approximately half obscured by the slide bar.



Slide Bar, Four Poster Binder.

The base portion of this mechanism is formed from a metal bar upon which two posts are mounted. The posts have rounded tops and carry a slot just below the top. When the top casing is pressed on to the two posts, they push aside the internal slide bar, which moves downwards against the return spring and slips back into the two slots in the base metal posts, thus firmly fixing the top casing to the posts themselves.

To complete the mechanism a loose bar called the lifter bar, having two more posts mounted upon it, is provided. These posts are spaced at a different centre to centre from those in the base metal. Sheets for use in this binder are punched with four holes, two of which receive the posts in the base metal. The other two receive the lifter bar posts which are pushed down through the holes. When the binder has been opened by a depression of the thumb-plate, the purpose of the bar is to allow sheets to be lifted off the base posts and held together by the two posts in the lifter bar, thus keeping them in alignment and providing for easy replacement in the binder.

Finally, it should be noted that locks on the mechanism and on the fore-edge of the binder are easily fitted, and this allows for its use where security is a factor.

Characteristics and Weaknesses

(1) It is of simple construction and inexpensive to produce.

(2) It is very light and is consequently not satisfactory for heavy duty.

(3) It is a fixed capacity mechanism—*i.e.*, it is not possible to expand or contract this binder. However, if fewer sheets than the capacity allowed by the spine are in use, then a compressor bar may be employed to push down on the two bottom posts and hold the sheets under compression.

(4) The writing surface provided by this type of mechanism is poor unless a large binding margin is allowed.

(5) This binder has a flat spine which is easily lettered or labelled, but which does not allow the covers to lie very flat on the desk and, therefore, creates a considerable bulge at the binding side of the sheets.

(6) This binder is not efficient in capacities over 3 in. and, indeed, is at its best in capacities up to approximately 2 in.

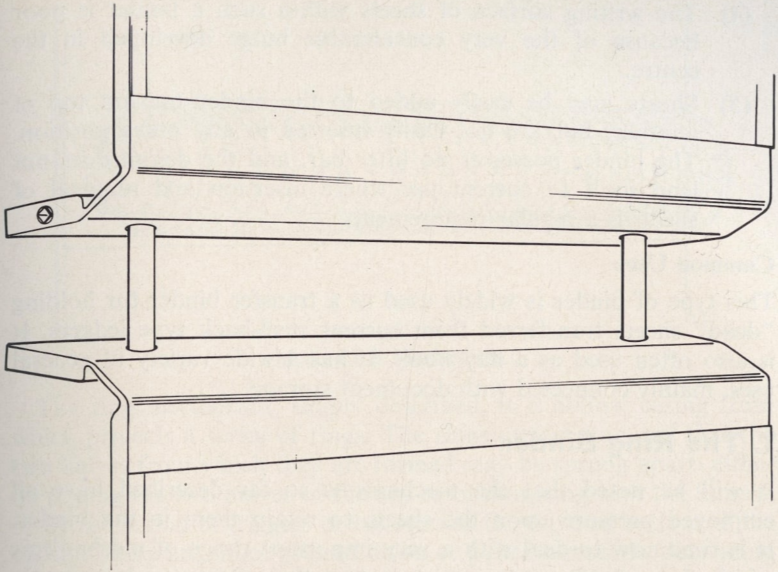
(7) This binder is not recommended for sheet sizes over approximately 13 in. × 14 in.

Common Uses

This binder is one of the most versatile of all the loose leaf mechanisms. It is widely used as a light-weight book of account for ledger, cash book or day book work. It makes a very satisfactory minute book, and may also be effectively used for a "Catalogue" cover or "Manual" application.

6. The Sectional Post Binder

The sectional post binder is one of the simplest and most commonly used of all loose leaf mechanisms. It consists of a hollow top casing, having two holes in the under and top surfaces and a flat sliding bar mounted inside in which there are two elongated holes. The sliding



Sectional Post Mechanism.

bar is operated by a thrust and return mechanism which functions on the turning of a key, inserted through a hole in the end of the metal, either clockwise to lock or anti-clockwise to unlock.

The second part of the mechanism consists of a flat base metal with two posts mounted upon it in coincident position with the holes in the top casing. These posts are tapped and threaded to receive screw-in sections, and the sections so added are themselves tapped and threaded so that they may be screwed one upon another, thus increasing the capacity as desired.

The hollow casing with its mechanism is commonly bound in canvas to millboard sides, thus forming the top cover of the binder. The base metal is similarly bound.

Similar binders are made without the key-wind mechanism. Separate screw-posts, with $\frac{1}{2}$ in. and 1 in. extensions, are used. They are quite effective and make economical storage binders.

Characteristics and Weaknesses

(1) The mechanism itself is very simple and almost foolproof.

(2) The price is modest, and this type of binder when made up is very strong and enduring.

(3) Sheet capacity is limited only by the number of sections screwed on.

(4) The writing surface of sheets within such a binder is poor because of the very considerable bulge developed in the centre.

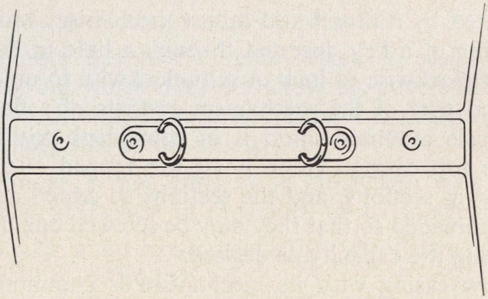
(5) Sheets may be easily added to the binder one on top of another, but are not easily inserted in any other position. The binder possesses no lifter bar, and the design does not lend itself to current use where insertion and removal of sheets is a regular requirement.

Common Uses

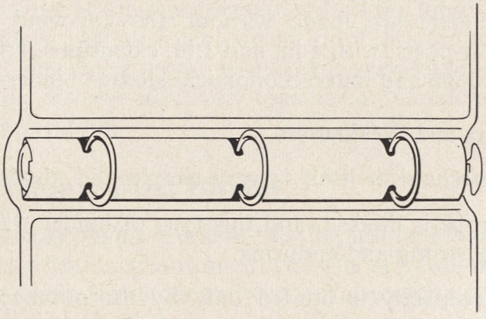
This type of binder is widely used as a transfer binder for holding "dead" sheets transferred from current steel-back type ledgers. It is also often used as a day book. It has a wide variety of general uses, mainly connected with document storage.

7. The Ring Binder

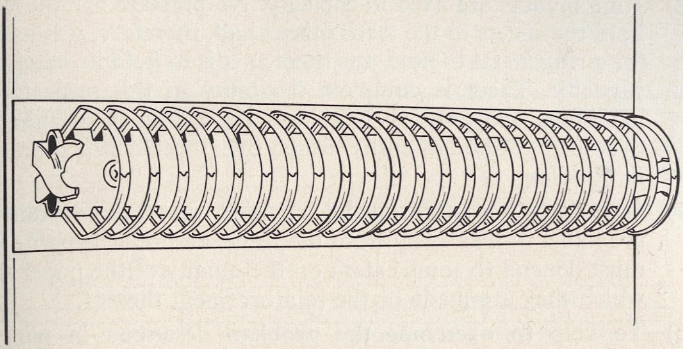
It will be noted that the mechanisms so far described have all employed pressure upon the sheets to retain them in the binder. It is time now to deal with a very important range of mechanisms which do not rely upon grip to retain their contents, but merely upon the strength of the paper used.



Two Ring Mechanism.



Three Ring Mechanism.



Multi-Ring Mechanism.

The ring mechanism, simply described, is a hollow casing from which projects a series of rings. The rings are so mounted that the two halves from which they are formed may be sprung apart, either by pulling the two halves of the top or bottom ring with the fingers, or by the action of triggers or boosters at the top and bottom of the casing. These are either pressed down or pulled outwards, depending on their design, and in this action the two halves of the rings themselves are sprung apart.

Commonly, ring metals have circular rings, but variations in shape are now introduced by many manufacturers. Nevertheless, the basic principle is still the same, and for the present purpose it will suffice to consider that the rings are circular in shape.

Sheets for ring binders are punched with circular or oblong holes in accordance with the shape of the ring section itself. They are then placed on the open rings of the binder, and when the mechanism is closed they hang loose on those rings.

Ring metal mechanisms have developed from the original type (which was a simple two ring fitting set at either 7 or 8 cm. gauge) to multiple ring fittings in which the rings are set at centres of $\frac{1}{2}$ in. to $\frac{3}{4}$ in., thus producing many rings in a given depth of the casing.

Ring mechanisms are manufactured in sheet capacities varying from approximately $\frac{1}{4}$ in. to 2 in. of paper.

Characteristics and Weaknesses

The most important characteristics and weaknesses of the ring binder are:—

(1) The fact that the sheets therein lie perfectly flat and require only a tiny binding margin, which varies between $\frac{1}{4}$ in. and $\frac{1}{2}$ in.

(2) Sheets may be inserted or removed at will from any part of the contents. It is only necessary to open the book at the place required and then to snap open the rings.

(3) Ring binders are fixed in capacity. No pressure is required to hold the sheets to the mechanisms and, therefore, it is as easy for a ring metal to hold one sheet as it is to hold its maximum capacity. There is complete flexibility in this respect. The maximum capacity is 2 in., but the sheets in mechanisms over 1 in., although easily turned over, need a little more care in handling.

(4) As no grip is exerted on the contents, sheets in constant use are liable to tear away from the rings, and their length of life must depend to some extent on the quality of the paper from which they are made or the reinforcement thereof.

(5) To help to overcome the problem described in para. 4, multiple ring binders have been devised. The multiplicity of rings ensures that the sheet of paper is not held at only a few points, but at a considerable number. This has the effect of spreading the load, so to speak, and greatly lengthening the life of the sheet itself.

(6) The ring mechanism may be attached to a great variety of bindings, both stiff and limp. It is light in weight and, unless actually crushed, will stand a good deal of hard wear and tear.

Common Uses

Ring binders are used for an immense number of purposes, perhaps the most common being the straightforward ring pocket notebook or college student notebook. It is one of the most commonly used mechanisms in loose leaf manuals and catalogue covers.

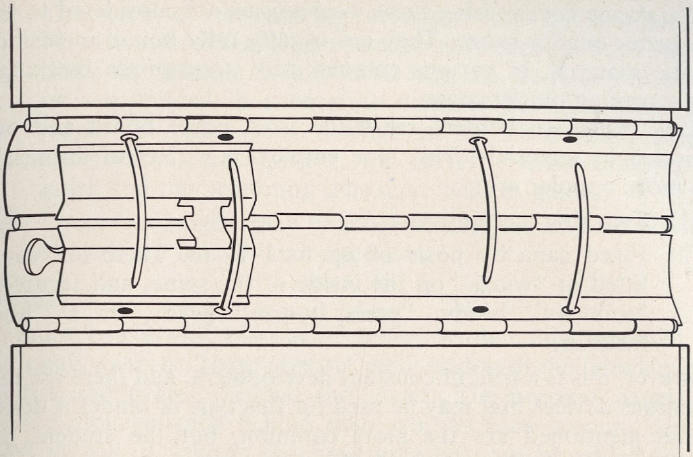
(Multiple ring binders for visible record use are dealt with in the chapter on Filing and Card-index Systems.)

8. The Prong Binder

The prong binder mechanism is contained within the spine of the cover itself. This spine is made in two halves, hinged at the centre and held together by a catch at the foot.

Each half is fitted with two or more curved prongs which, when the binder is closed, almost touch the side of the opposite half of the spine. When opened, they are sufficiently far apart to allow sheets to be extracted or inserted at will at any given part of the binder, as in a ring book.

Solid covers are hinged to the outer edges of the two sides of the binder's spine. This mechanism is often constructed in such a way that the opening catch, which is operated by the depression of a lever, has two positions—a fully-closed position and a half-open position before the binder assumes the fully-open position to allow for the extraction or replacement of sheets.



Prong Mechanism.

This half-open position is designed to allow the sheets to lie perfectly flat for writing upon; thus the same effect is obtained as in a ring binder, only a small ½ in. to 1 in. binding margin being necessary.

Characteristics and Weaknesses

(1) It has a fixed capacity, most effective at about 2 in., though it may also be available in 1 in. and 3 in.

(2) Sheets may be very easily inserted or extracted from any given position in the binder. If the sheets are not accurately punched, tearing will occur at the punch holes.

(3) A very flat writing surface may be obtained.

(4) It is light and strong—stronger in fact than any ring binder.

Common Uses

In a multiple prong form, it is very often used as a visible record binder. (These are dealt with in the chapter on Filing and Card index Systems.)

It makes an excellent book of account and, within its limitations, is adaptable to uses over a very wide field.

9. Loose Leaf Fittings for Catalogue Binders

Loose leaf catalogues are in considerable demand and great variety. Among the mechanisms already described, the following are in regular use for this purpose:—

(1) Ring and multi-ring mechanisms;

(2) Slide bar mechanisms;

(3) Prong mechanisms.

Catalogue covers using these mechanisms are considered to be in the better-quality range. They are usually fully bound in rexine or plastic material, in various colours, with appropriate blocking or silk screening on the cover.

Less expensive binders are made from cover board and other light-weight materials. This type employs a variety of fittings, but the more popular are:

(1) Two ring mechanisms.

(2) Fixed capacity posts of up to 1–1½ in. These are usually fitted to "wings" on the inside of the spine, and secured by "screw-in" heads, "press button" heads, or a "hook" fastener.

However, this is a field of constant development, and there are many ingenious devices that may be used for this type of binder if desired. Those mentioned are the more common, but the student must become familiar with new methods as they arise.

The advantage, of course, in using loose leaf covers is the ability to discard out-of-date information and to substitute new matter, and so maintain a completely up-to-date catalogue or manual.

10. Advantages of the Loose Leaf System

Nowadays the advantages obtained when using loose leaf instead of bound ledgers are commonly known and widely appreciated. Nevertheless, the good stationer must understand them well, and the advantages claimed for loose leaf ledgers over bound ledgers are therefore set out below:—

(a) The current ledger is not encumbered with dead or closed accounts, nor need it contain a number of blank pages. Only the active section of any account need be retained in the ledger; the old pages may be transferred to a transfer binder, but they will be kept therein in the same sequence, so that where reference to them is necessary this will be quite a simple matter, and the complete details of any account are readily accessible.

(b) The ledgers are continuous or "perpetual" and extra leaves may be added for each new account.

(c) An account is continuous, not scattered over many pages of the ledger. The task of re-heading accounts, re-writing the index and transferring balances, which has to be done with a bound ledger when an account overflows its allotted pages, is eliminated. When a big bound ledger is nearing the end of its current use, it is not uncommon to find an active account appearing in several places, but this never occurs in a loose leaf ledger. The whole of an account can be in only two places, *i.e.*, in the current ledger or in the transfer binder.

(**d**) The method of indexing evidences the main difference between a loose leaf ledger and a bound account book. In the latter the index is usually sewn into the front of the book, or is contained in a separate volume, but in a loose leaf ledger the index runs through it. In the normal, strictly alphabetical, arrangement, the leaves themselves form an index and the projecting tabs serve only as guides.

(**e**) Loose leaf ledgers may be much smaller than bound account books both in bulk and sheet size.

Indexing

The index consists of a series of strong leather tabs mounted on stout quality sheets. These tabs are embossed with the letters of the alphabet and project beyond the sheets. The account pages are collected alphabetically behind each tab. As each account can be moved at will, it follows that new accounts can be added to the collection, or old accounts taken away, without disturbing the alphabetical sequence. So, finding an account for, say, "Mansbridge & Co." merely means opening the ledger at the index tab "M" and all the accounts with the initial letter "M" will be found in one place.

There may be many accounts under the letter "M," so further subdivision is necessary. In the case of the vowel method, the index sheet is ruled off into columns, each headed with a vowel—A, E, I, O, U, and Y—and the account is entered into the column appropriate to the first vowel occurring in the name. Thus, the account of "Mansbridge & Co." will be under the index sheet "M" and entered in the column headed "A." The account sheet for, say, "Meadows & Co." will be filed under the "M"-tabbed index sheet and be entered in the column headed "E," and so on.

It is necessary now to be able to locate any particular account with the initial letter "M" among a number of such accounts, so the accounts are numbered from 1 up, under each main index sheet. This "account number," really the equivalent of the folio number, is entered as well on the index sheet alongside the name.

So, to find "Meadows" the ledger is first opened at the index tab "M," where all the accounts with the initial letter "M" will follow; the reference to the vowel column "E" on the index sheet will reveal the name and the account number. It may be, for instance, "M.18," which means that it is the eighteenth account under the "M" tab. It must be clearly understood that the first account under each letter starts with 1, and the next 2, and so on. "French" might be account "F.8" and "Ramsbottom" "R.22." The accounts are not numbered throughout the ledger but in sequence from 1 up under each letter.

One other number on the ledger sheet is required, and that is the "sheet number." Obviously, the first sheet issued to an account is sheet 1, and the next sheet 2, and so on. The *sheet* number progresses numerically according to the number of sheets issued, but the *account* number never changes.

There comes a time when old sheets can be transferred from the current ledger to a transfer binder. "Meadows," who is "M.18," or the eighteenth account under the "M" tab, may be using sheet 32, the previous ones having been removed, but he still remains account number "M.18."

In practice, as the account numbers never change, the bookkeeper is able to memorize them easily, and turn directly to each account without consulting the index sheet.

There are other methods of indexing, besides the alphabetical, which are suitable to certain types of business. For instance, a ledger may be indexed geographically under towns. The projecting tabs would have the names of the towns embossed on them, and under each town the accounts would be arranged alphabetically as already described. Such a system would hardly be feasible in a bound book, for, inevitably, from time to time the pages allotted to a particular town would be filled up and a new account would have to be entered somewhere else in the ledger.

Again, some firms like to arrange their ledgers in areas according to travellers' journeys. Such a plan is possible in a loose leaf book, but hardly practical in a bound book for the same reasons referred to in the geographic arrangement.

Size

When a bound ledger is ordered the main consideration is the *large* account, and a book is chosen with a sheet size that will accommodate it, and with a sufficiency of pages to ensure that the ledger will have a reasonable life. In consequence, in a business of any size, the bound ledger will usually be quite a massive book, but, since many accounts occupy only a few lines, a large amount of space in it will remain blank, or several small accounts may be squeezed into a blank space. Some of these accounts will be open, others dead. The mixing of open and closed accounts causes confusion and error at statement time.

In the case of a loose leaf ledger the determining factor is the number of lines occupied by the *average* account. In most businesses the average account does not use up many lines: a comparatively small number of accounts are large ones running into several pages over a period.

A loose leaf ledger is therefore selected with a page size which will comfortably carry the entries of the average account, which makes it possible for much smaller ledgers—usually 9¼ in. × 11¼ in., or 11¼ in. × 11¼ in.—to be used. But even though a smaller page is used, the larger account is still completely catered for, simply by inserting additional sheets; and at the same time the whole of each account is in one place, whereas when an account section is filled in a bound book, transfer has to be made to another part, so breaking the narrative continuity. In a loose leaf book one account only is entered on a sheet, thus preserving the unit plan, whereby each sheet is independent, and can be moved without disturbing the continuity.

Thus, the smaller loose leaf ledger saves desk room and safe room: and, since it has few blank spaces in it, but only live accounts, its bulk too is much less, thereby rendering it lighter, more easily portable, and handier for reference and posting.

This point should be thoroughly understood by the stationer and the assistant. Often when a customer wishes to install the loose leaf system he tears a sheet out of a bound ledger and takes it along as a sample of what he wants. Without further thought some stationers measure the sheet, add a binding margin, and order a loose leaf ledger without thought of its size. The result is a ledger is made of, say, 17 in. × 14 in., filled with 500 or more sheets, which is almost more than a clerk can lift, and with a page size very much too large for the average account.

A little thought and the application of the principle outlined here would have made it clear to the stationer at the outset that a neat handy size, 9¼ in. × 11¼ in., would have been quite suitable for the customer's purpose, and much more satisfactory to him.

This comparison of size indicates an important advantage of the loose leaf ledger, for whatever the business, and whatever its size, the *average* account is the main consideration, and the smallest convenient ledger may be employed.

11. Special Ordering Requirements

In taking orders for loose leaf books and passing them on to manufacturers, it is of the utmost importance that the following points should be kept well in mind:

(a) **Binding Side:** The binding side of loose leaf books is always given first.

(b) **Sheet Size:** In all catalogues the sizes given are the sheet sizes. In making the binders, proper allowance is made by the manufacturer for margins and index tab projection at the fore-edge.

(c) **Stock Lines:** When ordering stock lines which conform in every particular to the specifications in the catalogue, it is only necessary to give the stock number, being careful to state this accurately, and to give such additional information as to style, grade or capacity as may be necessary.

(d) **Special Goods:** Any variation from catalogue specifications means that the item must be specially made, hence the following details must be given:

(1) Quantity.
(2) Name of device.
(3) Sheet size.
(4) Binding side (the dimension given first is understood to be the binding side).
(5) Diameter and number of posts.
(6) Centre to centre of posts (send sheet if possible).
(7) Length of posts on solid post binders.
(8) Holding capacity of current binder.
(9) Delivery instructions.

(e) Stock Sheets: In ordering stock sheets it is only necessary to give the catalogue number and the form required.

(f) Special Sheets: When special sheets are ordered, endeavour should be made to fit them into stock size binders, even though it may be necessary to allow a trifle more or less binding space or width of column. This enables supplies to be bought at less cost, and saves delay in executing orders. Usually 3 in. is a sufficient binding margin. A sheet of paper should be trimmed to exact size and a sketch made on it showing the size of heading, the distance between feint lines and the down rulings. The headings should then be indicated, preferably in block capitals. The quality of paper should be specified and it should be stated whether a proof is required.

Choice of Binder

In deciding the type of binder best fitted to a customer's needs, the following information should be obtained:

(1) The size of sheet.
(2) The number of sheets to be held in the book.
(3) The kind of wear the book will receive.
(4) The purpose for which it is to be used.

When these details are ascertained, the retailer, or the assistant, with his knowledge of the various types of loose leaf book available, should be able to guide his customer to a correct choice.

For example: the customer's sheet measures, say, 15 in. × 16 in. and he wants a book to hold from 200 to 500 sheets. He wants to add and withdraw sheets frequently from any part of the book. It will be in constant use. Obviously a well-bound thong ledger is wanted, and, not forgetting the advantages of a stock size, he should be recommended to use a stock binder with a sheet size of 13 in. × 14 in. or 14 in. × 17 in.

Again, the size required is 5 in. × 8 in. for a book of only 100 sheets, which will be kept in the manager's desk. Here the inquiry shouts for a four-post, spring-operated, lifter-bar type.

Such instances emphasize the necessity for a knowledge of all the types of loose leaf book. As the customer unfolds his story the retailer or the assistant should be able to visualize the various binders so that he is finally able to suggest with confidence the one most suited to the particular needs.

Minute Books

The Companies Act 1948 recognizes that a loose leaf minute book is just as much a book as a bound one, provided that adequate precautions are taken for guarding against falsification and for facilitating its discovery.

This question of precaution has been considered by the Chartered Institute of Secretaries, and it is generally understood by its members that the following precautions are adequate:

(1) The minute book should be provided with a lock which, for preference, should be on the spine of the book rather than on the covers, so as to permit reference to be made to the book without having to undo the lock.

(2) The key to the lock should be in the hands of the secretary or other responsible official.

(3) Loose leaves should be kept under lock and key and issued under the control of the secretary or other responsible official.

(4) The loose leaf pages should be serially numbered as issued by the official in whose care they are kept.

(5) The minutes should be serially numbered throughout the book and not in a separate series for each meeting.

(6) The last page relating to each meeting should be signed by the chairman, and all other pages initialled (or signed) by him.

One further precaution might well be added, and this applies equally to bound and loose leaf minute books: there should be no blank spaces between minutes, and they should carry on continuously. Otherwise it might be possible to make false entries in the spaces, which could be on a page bearing the initials or the signature of the chairman.

12. Ledger and Wage Recording Systems

Ledger Systems

The arrival of loose leaf binders to house accounting records previously kept in bound books brought many advantages in "handling" to the book-keeper. The standard double entry method of book-keeping, however, was not in any way changed. While this method has been accepted for very many years as the means by which the day-to-day transactions of a company are recorded and proved correct, it suffers from certain disadvantages which are becoming less and less acceptable in the climate of modern business. Some of the most marked are listed hereunder:—

(1) The double entry system is complicated. It requires lengthy and tedious training to assimilate.

(2) It is not always fully understood in many of the small and medium-sized businesses which use it.

(3) Checking and balancing accounts at the month end is slow, with the result that statements are seldom dispatched promptly and delays in settlement are caused.

(4) Book-keeping errors are not immediately detectable or easily traced at the month end.

(5) Provision of regular information as to the financial state of a business involves a major effort by the book-keeper, with the result that such information is not sought as frequently as it should be.

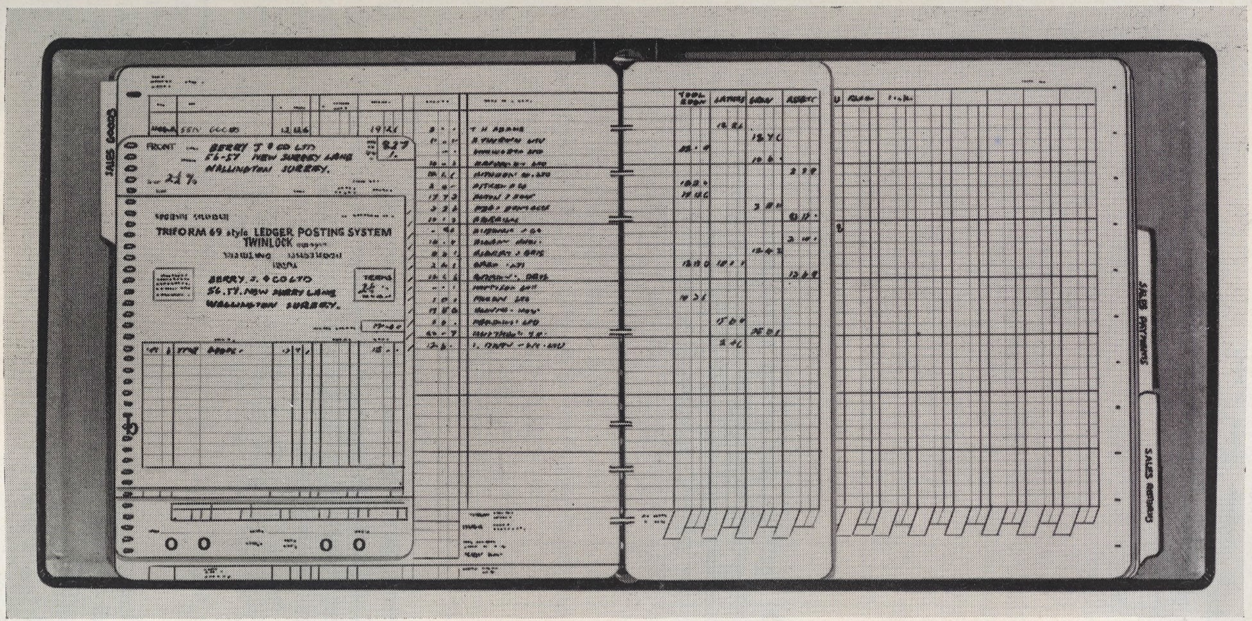
This list is far from complete and indicates only major weaknesses, but these, added to problems caused by the pace of business, shortage of skilled book-keepers and the high cost of labour, indicate the need for another form of book-keeping more in line with the demands of present times.

Book-keeping machines have already solved most of the problems involved, but their cost places them out of the reach of many firms. Not unnaturally, therefore, manufacturers of manual book-keeping systems have adapted the machine system to hand-written records.

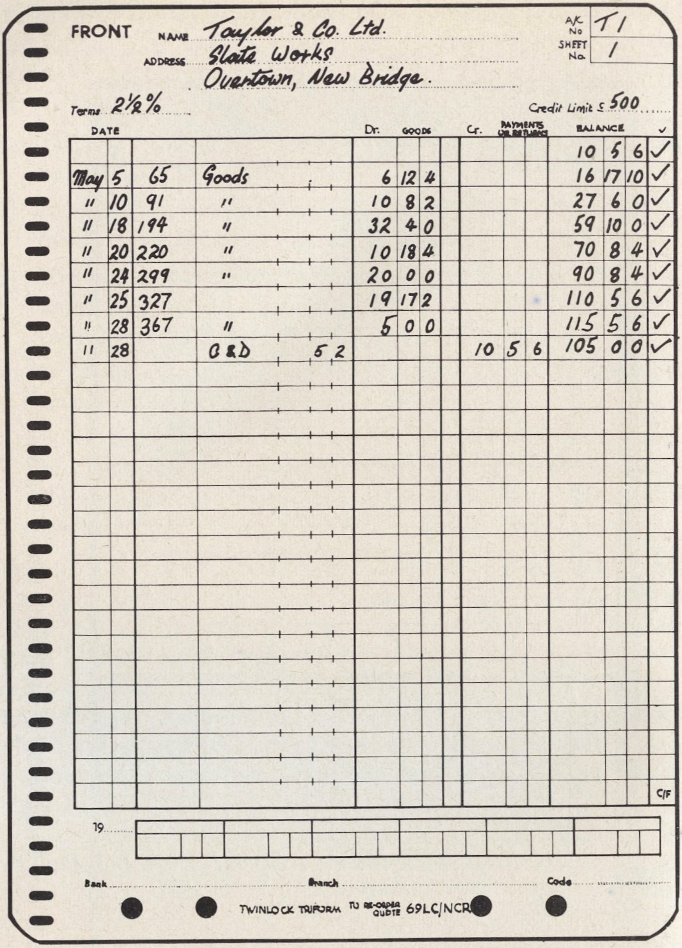
This has been successfully accomplished by the introduction of the **Billing Board**—a flat board made in many sizes and styles, having a device on one side which allows three of the principal documents used in book-keeping (the statement, the ledger card and the day book sheet) to be mounted one on top of the other and in register with one another. Thus, by the use of interleaved carbon paper (or carbonless paper), it becomes possible to make one entry on the top document (usually the statement) which reproduces on the other two, thereby completing three entries in one writing.

In this way, much entry time is saved. The use of the 3 col. M/A layout (illustrated below) for statement, ledger card and day book summary simplifies calculation and shows a "running balance" of each account in the balance column.

It is not proposed here to make a detailed comparison between the two forms of book-keeping involved. Suffice it to say that such systems make use of standard types of ledger trays and loose leaf binders to house ledger cards and day book sheets. They involve the supply of stationery which actually replaces the ledger and day book


SALES GOODS
TRIFORM 69 style LEDGER POSTING SYSTEM
TWINLOCK
SALES PAYMENTS
SALES RETURNS

Three in One Ring Binder System—with Billing Board on the left.



FRONT NAME Taylor & Co. Ltd. A/C No T1

ADDRESS Slate Works SHEET No. 1

Overtown, New Bridge.

Terms 2½% Credit Limit £500

DATE					Dr. GOODS	Cr. PAYMENTS OR RETURNS	BALANCE	✓
							10 5 6	✓
May	5	65	Goods		6 12 4		16 17 10	✓
"	10	91	"		10 8 2		27 6 0	✓
"	18	194	"		32 4 0		59 10 0	✓
"	20	220	"		10 18 4		70 8 4	✓
"	24	299	"		20 0 0		90 8 4	✓
"	25	327			19 17 2		110 5 6	✓
"	28	367	"		5 0 0		115 5 6	✓
"	28		C & D	5 2		10 5 6	105 0 0	✓

C/F

19.......

Bank .... Branch .... Code ....

TWINLOCK TRIFORM TO RE-ORDER QUOTE 69LC/NCR

Three Column Accounting Layout.

sheets, together with the statements, traditionally supplied by the stationer.

The principal advantages claimed for this form of book-keeping are:—

(1) Three essential records—statement, ledger card and day book sheet—are produced in one writing.

(2) Every day's work can be proved accurate as soon as completed. Errors may be traced at once and corrected.

(3) The balance of every account is always available without additional calculation.

(4) Statements are built up during the month and are ready for instant dispatch at the month end.

(5) Figures showing the financial state of the business are easily obtainable and may be assembled with a minimum of effort and delay.

(6) Operation of the system does not require a lengthy training period, but may be learnt by comparatively unskilled people in a matter of hours.

It can be seen that, contrary to the position after the introduction of loose leaf ledgers, the actual method of book-keeping is now changed. A knowledge of the principles of billing board book-keeping would appear to be essential to any commercial stationer who wishes to retain his place as a supplier of accounting equipment and stationery to even small and medium-sized businesses.

Wage Recording Systems

When the government introduced a system for collection of income tax at the time payment of salary or wages was made—the scheme known as "Pay as you earn" or P.A.Y.E.—it placed on the employer a considerable extra administrative expense. By law the employer was required to collect his employees' taxes and to pay them to the government. He was also obliged to record such collections and to render a yearly account of them. Further, he had to show each employee what deductions had been made from his pay. In addition to this the normal wage book had to be kept.

Up to the inception of P.A.Y.E., employers kept wage books on either the bound or loose leaf principle, but once deduction of income tax at source became law the two additional records required were really duplicates of the wage book entry.

The account made to the authorities showing tax deducted weekly is rendered on a card known by its reference number P9. That showing tax deducted monthly is rendered on a rather similar card reference P11. All P.A.Y.E. wage systems must first receive government approval. Once that is obtained, any firm using such a system makes a return at the end of the fiscal year on a form known as a P9S or P11S. These forms show only the total year's tax deducted under the various headings. The weekly or monthly details are contained on forms used in the system itself.

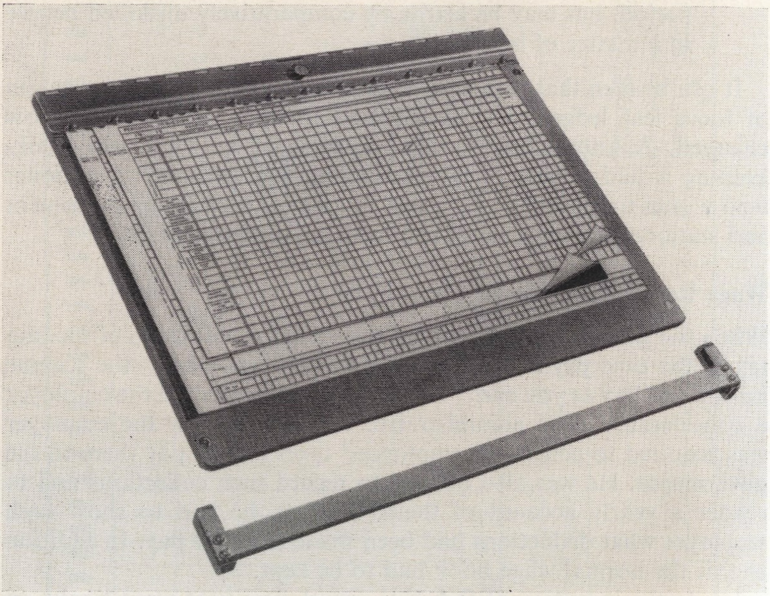
Such systems make use of billing boards in a similar way to that described under "Ledger Systems." This time three forms are designed to be placed in register over the pegs of the billing board.

All contain similar information and are known as:—

(*a*) The Personal Record Sheet. This takes the place of the P.9 or P.11.

(*b*) The Payslip Sheet. This may be torn into strips, each forming a payslip for insertion into the pay packet.

(*c*) The Wages Sheet. This sheet forms a summary of a number of wage payments and is filed to form the employer's wages book.



Billing Board and Line Guide.

In practice (*b*) and (*c*) are placed on the billing board and interleaved with carbon paper. The personal record sheets are placed on top, one at a time. The wage entry is made and the particular personal record sheet removed. Another is placed in position, entered, removed, and so on until the two bottom sheets are filled. Then fresh pay slip and wage sheets are mounted on the board and the procedure continues until all wage entries are complete. The use of a billing board in this context offers a number of advantages:—

(1) All three records are completed with only one writing.

(2) All three entries are identical and copying errors are thus avoided.

(3) The wage sheet may be so designed that the summary of wages thereon may be easily checked and proved correct.

(4) The writing of the P.9 or P.11 is eliminated except for the entry once a year on the P.9S or P.11S.

(5) It is possible to extend this system to cover the simultaneous writing of certain other returns required of the employer at the year end.

Wages can now be paid by cheque or credit transfer (the payment of the amount direct to the employee's bank account). The billing board method can accommodate this system by the addition of a cheque or credit transfer advice slip to the records already mentioned.

Other Systems

The writing of related records on the billing board system is equally suitable for records other than those already mentioned. For instance, *Hire Purchase Records*, in which the payments card, ledger record and summary sheet are produced in one writing; *Receipt Issuing* and daily summary sheets; *Salesmen's Daily Report Sheets*, with turnover record and summary of calls.

In all cases where a record must be made on one or more forms of similar design and, in addition, a summary of entries must be compiled, the system may be used to advantage. All systems involve the use of loose leaf binders to hold the forms when not being entered on the board, and, with the increasing interest and demand, close attention to developments in this field is advisable.

CHAPTER 10

Filing, Card-index, and Visible Record Systems

There is no great history to anything resembling the filing products of today. It may be possible to trace the word "file" to the Latin *filum* for "thread" and, with a little imagination, to see the connexion. *Index* is also a Latin word, but this simply indicates a list. Apart from the spike file, which is the most primitive filing device still in use, most filing equipment originated less than one hundred years ago. Although commercial records have always been kept, one hundred years ago books were widely used and bound ledgers contained the accounts. Before mass-appeal products, business records did not accumulate rapidly and record-keeping was no great problem. During the latter half of the nineteenth century commerce intensified, factories changed their methods of production and sales of innumerable products reached numbers not previously contemplated. Suddenly it became urgent to reorganize office procedures. The new typewriters could turn out the documentation as fast as the factory could make the goods, and within the space of a few years filing, as we think of it, came into being. As the new commercial society absorbed excess labour and building space office staff and office space became more difficult to obtain and more expensive. By the end of the second World War there was a filing and record-keeping problem, and under this pressure the modern filing industry came into being. It is still possible to have an efficient filing system with practically no equipment at all, but it is no longer practicable because such a system needs a devoted filing clerk and plenty of space. Nowadays employees have to be used on more productive work than filing and no one can afford to waste space. The aim should be to sell filing equipment which reduces the incidence of error and reduces the role of the operator to such an extent that in the smaller and medium-sized office anyone can use the system without loss of efficiency. The larger users, with professional filing managers, will demand high performance from the equipment in any case.

1. Types of Filing

Before it is possible to begin to describe the methods, it is necessary to make clear the broad divisions of filing which have been determined by the sort of things that people file and the way in which they desire them to be filed.

(a) Method of Classification. This is generally termed "the system." Out of the necessity to file such a variety of items, numerous different systems have evolved over the years. They will be more fully explained later on. This term, however, should not be confused with "equipment"—which is the actual file cover, binder or cabinet in which the system is housed. Where convenient, it will be described in this chapter, but more information will be found in the chapter on Office Furniture and Equipment.

(b) Document Filing. This refers to the filing of such items as letters, catalogues, invoices, purchase orders, cheques, reports, insurance policies, patents, legal documents, etc. There are many methods by which documents may be filed, and these will be described in due course.

Filing equipment in all its forms is designed to implement system with maximum effectiveness. Good filing is a combination of the right system and the right equipment.

The equipment may be divided into two broad divisions:—

(1) **Comprehensive filing units**: where the files or folders are housed in filing cabinets or cupboards, on the "vertical" principle;

(2) **Individual letter files**: for personal or subject use.

The majority of these are suitable for shelf use and are based on the "horizontal" or "flat" filing principle.

(c) Information Filing. With this type of filing the only paper involved is that which is part of the equipment. The information is entered by hand or machine on to paper or card with two main purposes:

(1) to enter the quickest possible reference of the facts;

(2) to insert or extract new and old material in the easiest possible way.

This type of filing may be for addresses, telephone numbers, technical specifications, credit ratings, stock control, production control, order records, medical records, staff records, educational records, transport control, book-keeping, etc. The traditional method is by the use of the non-visible vertical card-index equipment, but this has now been extended to many other forms and variations, all of which are loosely referred to as "card-index systems." Consequently the variety of function and the assortment of equipment available have so developed that there is now almost a separate industry dealing with this type of equipment.

It may be divided into three broad divisions.

(1) **Non-Visible Card Indexing:** Where the cards, irrespective of how they are housed, are "blind" until the particular card required has been located and extracted.

(2) **Visible Card Indexing:** Where the cards, irrespective of housing, overlap each other to provide a visible edge for more speedy location.

(3) **Visible Strip Indexing:** Where the formation is of a restricted or semi-permanent nature and fast reference is required.

Within each category, various methods of housing the cards are available, each of which will be explained later.

(d) Microfilm Filing. This method is used for filing large quantities of documents, particularly with a view to saving space. It can obviate the need to file documents altogether. The specialist nature of its use precludes its inclusion in this chapter, but reference to it is made under Reproduction Processes.

Of course, people file almost anything, but the above should act as a guide. It is also possible to file documents and information in a composite system, but whenever there are documents to be stored the document filing method is normally used.

2. Methods of Classification

Essentials of a Good Filing System

In considering any system of filing, regard must be paid to a number of factors which assist in the efficiency of the system.

(a) Simplicity: The system should be simple in its operation. However cleverly it may be devised its ultimate effectiveness depends upon its operation, or more specifically upon that incalculable human factor, the filing clerk. Thus the simpler the system, the less mistakes are likely to occur, and the more efficiently it will function.

(b) Suitability: As has already been indicated, there is a filing system for every purpose, but not *every* system will suit *every* purpose. The chronological filing of invoices in a book-keeping system might be ideal, but quite inadequate for filing correspondence. The stationer should understand the use of each type of system, and get to know his customer's requirements so that he can recommend the one most suitable for the purpose.

(c) Adaptability: This is an important consideration, for it frequently occurs that a particular filing system needs to be adapted to suit changing requirements of a business.

(d) Accessibility: The nature of documents will determine the method of arrangement to be adopted, but, whatever this may be, accessibility, facility of reference, is the paramount filing principle. The system must enable documents to be classified in any desired manner and to be kept in order for future reference. Any particular item should be able to be located with certainty and without any delay: this is the acid test of any system, and if a document cannot be found there is something wrong with the system—or with the human element operating it.

Alphabetical

This indicates a strict ABC arrangement and files are arranged according to their initial letter. The arrangement is further determined by the second letter and, where the second letters are the same, then by the third letter and so on. The following illustrates strict alphabetical order:—

1. Page
2. Palmer
3. Passmore
4. Peters
5. Petersham
6. Pink
7. Pond
8. Powell
9. Powney

Vowel indexing is a variation of the strictly alphabetical method. It is useful for small systems and helps to save time in locating documents where a more detailed breakdown is not necessary. As in the alphabetical system, each document is filed according to the initial letter of the name, but instead of its position in the division depending upon the second letter of the name, this depends upon the first *vowel* in the name after the initial letter—*e.g.*, Aa, Ae, Ai, Ao, Au or Ay.

The following names will be indexed thus:

Ashton	under	initial	A,	vowel	o—Ao	section.
Brown	„	„	B,	„	o—Bo	„
Clarke	„	„	C,	„	a—Ca	„
Smith	„	„	S,	„	i—Si	„
Tyndal	„	„	T,	„	y—Ty	„
Wheeler	„	„	W,	„	e—We	„

Sub-division Indexes

For larger systems, however, the alphabetical method presents problems. This is because some names, such as Brown, Jones, Smith, etc., occur frequently and others less so, which results in some files being overcrowded, whilst others are hardly used at all. This precludes equal distribution throughout the system. In order to overcome this difficulty a further breakdown of the alphabetical index is desirable. The extent will vary according to the size of the filing system, but the following is part of such an index based upon 100 sub-divisions.

Caa — Caq	Sub-Division	13
Car — Caz	„	14
Ce — Ch	„	15
Ci — Cn	„	16
Coa — Com	„	17
Con — Coz	„	18
Cr — Cz	„	19

The object of all such divisions is to break down the system into small, equally used parts. In addition to the above problem, it is also possible to arrive at different versions of alphabetical classification. There is no question of the order of the alphabet, of course, but there can be other difficulties. Names such as ABC Ltd., Le Mare, O'Riley, Y.M.C.A. are usually filed strictly alphabetically. The prefixes M', Mc and Mac are usually classified as if they were all spelt Mac, but that does not exhaust the difficulties. A good guide to alphabetical classification is the telephone directory, and it is always sensible to file where people will expect to find.

Numerical

Numerical filing is straightforward and accurate and never presents any problems of spelling or sequence. It normally refers to a filing system for documents printed with a serial number or stamped with a serial number in order of receipt or issue. Some sort of division is usually made into blocks of 100, 1,000 or whatever is convenient. It could also mean that for general filing each correspondent, customer or subject is alloted a number and all relative documents are filed according to that number. In this case the system requires a cross-reference, which is usually alphabetical. To locate a file, reference is made to the alphabetical cross-reference and then to the numerically arranged file. Correspondence with one firm on a variety of subjects would be referred to as follows:—

Brown, John & Co. Ltd.	Stationery supplies	106
	Municipal contract	121
	Imprint diaries	197

With numerical filing all new material is added to the end of the system and the problem of interpolation does not arise.

Terminal Digit

This is a variation of numerical filing and is used for filing large quantities of pre-numbered documents.

If ten thousand pre-numbered invoices were issued every day there would be a "traffic jam" at the filing cabinets, as all the activity would tend to fall upon one place in the system. Terminal digit avoids this situation by spreading the work load over the whole of the system. Suppose invoices were pre-printed with numbers from 123456 to 223456. For purposes of indexing, the last three digits are read in reverse. In this way invoice number 123456 becomes document number 123 in file number 654. Likewise invoice number 203401 becomes document number 203 in file number 104. In this way the system fills up evenly, and filing and finding is constantly spread over the full range of numbers. The disadvantage is that space has to be pre-allocated, but this is usually possible with pre-numbered documents. It must also be remembered that, for reference, consecutive numbers will be in entirely different parts of the system.

Geographical

This method can have considerable advantages, depending upon the sort of information to be filed. For instance, it becomes possible to group a representative's territory or a district office area, or in the same way international divisions can be used. An elementary form of geographical index would file by county, city and account name. This could further be divided into sections of a city or streets, such as a salesman's route. There are disadvantages which must be guarded against. County boundaries sometimes divide the environs of a city, and counties are by no means uniform in area or in population. Countries appear and disappear and political groupings change.

Chronological

This method of filing usually means filing in date order and could be used for filing publications, periodical reports and returns. Classification is simple, depending upon the unit of time in use—*i.e.*, day, month, year—and, while there are no complications, obviously the system is limited.

Universal Decimal Classification.

This method is usually referred to as U.D.C. It was the original idea of an American librarian called Melvil Dewey that a subject classification should be available to cover every aspect of every subject. He described his system as being, in essence, a subject classification and a relative index, and first published a decimal classification (D.C.) in 1876. In recent years U.D.C. has gained wide acceptance and is currently used by architects and the building trade in this country. Much of their sales literature and technical publications is issued under U.D.C. references. Architects are involved with office and filing equipment, and it is advisable to know at least the rudiments of U.D.C. The basis of U.D.C. is the division of all knowledge into ten groups:—

·0 Generalities: methodology, documentation, scripts; recording, collection and dissemination of information.
·1 Philosophy, metaphysics, logic, ethics; psychology.
·2 Religion; theology.
·3 Social sciences, including statistics, law, education.
·4 Philology; languages.
·5 Pure science, mathematical and natural.
·6 Applied science; medicine and technology.
·7 The arts, including architecture, photography, entertainment and sport.

·8 Literature.
·9 Geography; biography; history.

Everything can be filed under these headings, and from there Dewey sub-divided each heading by ten, each sub-heading by ten, and so on, as often as necessary. Hence the name decimal. The classification for "pen and pencil caps" develops as follows:—

6	Technology
68	Specialized trades and crafts
686	Book-binding, writing and office articles
686·8	Stationery, writing, drawing and artists' material
686·863	Pens and pencils
686·863·07	Caps and clips for same.

The decimal point is introduced after every third digit to make the numbers more easy to handle.

In this way every article can be classified in a manner which is understood all over the world, regardless of language or culture. U.D.C. is a subject in itself, but anyone attempting to sell filing system equipment should at least be aware of it and of its implications.

Special Classification

Obviously there are other methods of classifying, and there must be many a special system peculiar to one particular firm. Such systems are, however, not really the concern of the stationer, although he should be able to offer advice on equipment.

3. Comprehensive Filing Units

First of all it is worth while to repeat the distinction between "equipment" and "system." "Equipment" means the actual file covers, binders, cabinets and so on. "System" means the method of classification. So far only the "system" has been considered. Now the various methods of filing will be described.

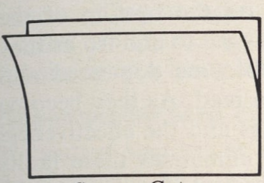
Non-Suspended Filing

With this method papers are filed on their edge in folders. The principal types of folder, which may be made from various qualities and thicknesses of manilla, are:—

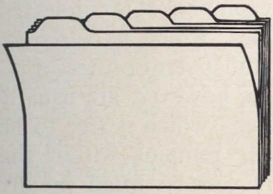
(a) The **Flush Cut Folder**. This is simply a piece of material folded exactly in half, and can be used for inserting into other folders.

(b) The **Square-Cut Folder**. Here the fold is off centre, so that the back cover protrudes approximately ½ in. beyond the front cover and so enables the visible portion to be used for titling.

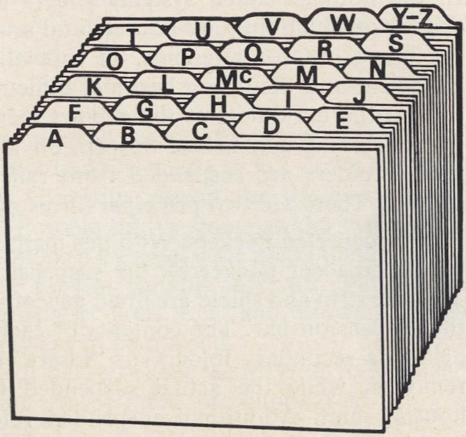
(c) The **Tabbed Folder**. This type has a projecting tab on the back cover, which also serves for titling, indexing, etc. The tab is in a different position on each folder. Usually the number is a set of five, so that "tabbed fifths" would indicate that five folders are tabbed in five different positions so that all are visible.



Square Cut.



Tabbed.



Guide Cards.

The B.S.I. standard for external sizes is as follows:—

	Folded edge in.		Front edge in.	Rear fold tabbed or untabbed in.
Quarto	$11\frac{3}{4}$	×	9	$9\frac{1}{2}$
Foolscap	$13\frac{3}{4}$ to $14\frac{3}{8}$	×	9	$9\frac{1}{2}$

Dimensions subject to manufacturing tolerance of $\pm \frac{1}{8}$ in.

Each folder serves to keep together all the relative documents according to the method of classification being used. They may also be divided by the use of **Guide Cards** made from stouter material. These, too, are available with tabs, either plain, or printed A-Z, 1-31, or consecutively numbered. Superior qualities of guide cards have the tabs reinforced with celluloid or they may even be fitted with metal window-type tabs, which are very much longer wearing.

Folders and guide cards are housed in filing cabinets. With this type of filing the cabinet is fitted with a compressor plate, which slides along the floor of the drawer and so enables the files to be kept in an upright position even when the drawer is not filled to capacity.

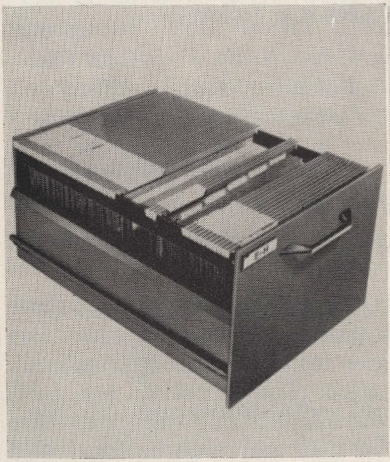
Although this method of filing is still widely used, it has been superseded by the much more efficient method of "suspension" filing.

Suspended Filing

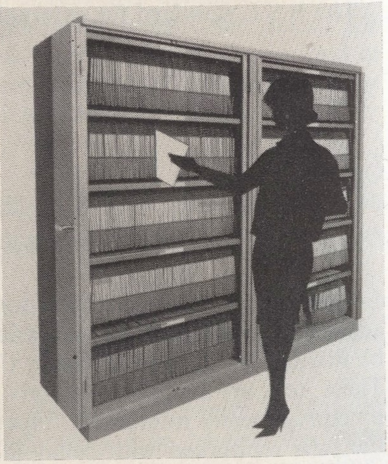
In the non-suspended system, folders rest on the bottom of the drawer in which they are housed, and are dragged to and fro as they are taken out for reference. In time they become dog-eared and inefficient and the titling becomes difficult to read. As they become full, so the untidiness of the cabinet increases and the effectiveness of the system diminishes. Suspension filing eliminates these faults as the folders are suspended from rails fitted to the sides of the cabinet. There are two principal forms of this filing:—

(a) Connected Pockets: With this method each pocket is connected to the adjacent pocket by the suspension bar, which is coloured. The title strip and shield are fitted beneath a transparent protector on the suspension bar. The contents of each file, however, are usually held in a secondary folder—or "insert" folder—which is free to be removed, while the actual suspended folder remains within the housing unit. Additional suspended folders can be fitted in any location desired.

(b) Individual Pockets: Each pocket is separate and on one of its suspension bars is fitted a tab. The title of the file is typed or written



Suspended Filing.



Lateral Filing.

on a paper title strip which is fitted within a transparent shield on the tab. The transparent title protectors are usually coloured and the tabs can be located in five positive positions.

The folders may be fitted with flat top strips instead of upright tabs. The title strips and shields are used in a similar manner.

Suspension filing equipment can be used to file almost any type of document and depends on this fact for its popularity. Such is its general appeal that it is also often used for filing information, such as educational records, technical specifications, etc., and, for composite systems, filing documents *and* information.

Sizes are quarto or foolscap, but the latter predominates and the A4 size is now being introduced.

Non-suspended Shelf Filing

Nowadays space is at a premium in many offices, and the cost of floor space is such that efforts must be made to cut down the area occupied by filing cabinets. For this reason the development of shelf filing has come about. Folders simply stand on the shelves like books in a library, being supported by adjustable metal dividers, and indexed by projecting guide tabs at suitable intervals. Thus more folders can be housed in a smaller floor area, and allowance does not have to be made for drawers to be opened.

Open shelving can be used, but, to effect security, or to keep the filing dust-proof, the shelving can be fitted into cupboards.

Suspended Lateral Filing

What are known as "lateral files" are used in cupboards in much the same way as suspension files are used in cabinets. Lateral files are suspended, but they are suspended across the cupboard in such a way that access is by the side of the pocket—*i.e.*, laterally.

There are at present many different styles of lateral file. Some hang from one central suspension rail, some from two suspension rails placed horizontally, and some diagonally. The positions and the dimensions of the rails on which these files are suspended vary considerably, and at present lateral files are not interchangeable. It is certainly advisable to purchase the rails from the same manufacturer as the pockets.

Some lateral files have two suspension bars per pocket, whilst others have only one. Some are linked at the top, some are linked at the front, and some are not linked at all. Also, some of these files have the titles at an angle and others have them placed vertically. Another variety has titles which can be varied from one angle to another. However, all lateral files have the following points in common:—

(*a*) They are suspended from side to side across a cupboard or similar housing unit;

(*b*) Access is to the side of each manilla pocket;

(*c*) The file titles are fitted on the open side.

Although lateral files may not be as popular as suspension files for general office use, they have one feature which is important—they take up less floor space. When files are housed in a filing cabinet, floor space must be allowed not only for the cabinet but also for the open drawer. With lateral files no such additional allowance is necessary, and the tiers of files can go up to six feet, or as far as the filing clerk can reach. Lateral files can be used as diversely as suspension files: they do the same job in a different way.

Circular Filing

A further development now appearing is the circular file, employing the same principles of floor space saving. The circular file is simply a large drum with a number of shelves or hanging devices, which is rotated by hand roller in the manner of picture postcard racks.

4. Individual Letter Files

The purpose of this section is to describe letter filing devices such as may be required by smaller offices or by private individuals, club secretaries, social workers and the like or for departmental records in larger offices.

Lever-Arch Files

This consists of a hinged cover, with two arch-shaped wires on which papers are filed. A lever operates the mechanism, and when the lever is raised the arches "divide" so that papers may be filed easily in any position or sequence. The arches are usually 8 cm. centre to centre, (B.S.I. Standard) though occasionally 7 cm. spacing is called for. Naturally, all papers must be punched for filing in lever-arch files, and suitable devices for punching the holes are described elsewhere.

When taking an order for lever-arch files, one must ascertain whether 7 cm. or 8 cm. gauge is required, and also whether papers are punched on the long edge (which would require the normal "upright" file), or on the short edge (in which case the file is described as "oblong" shape).

The B.S.I. standard for sizes (external dimensions) is as follows:—

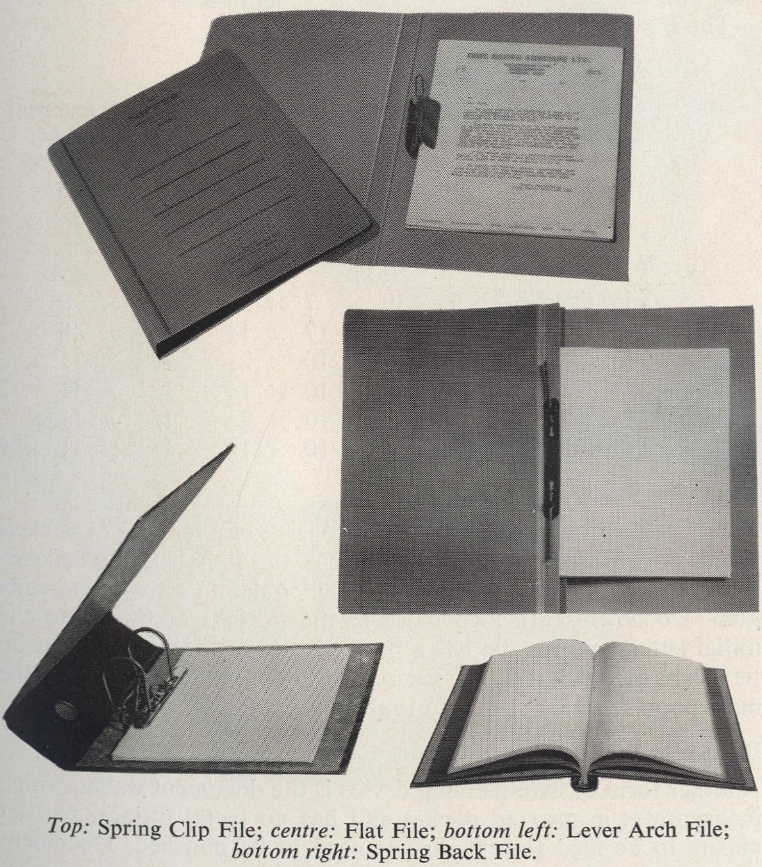
		inches
(i) Upright shape.	Octavo	9¼ × 8 × 3¼
	Quarto	11¾ × 11 × 3¼
	Foolscap	13¾ × 11 × 3¼
(ii) Oblong shape.	Octavo	7¾ × 10¾ × 3¼
	Quarto	9¾ × 13¼ × 3¼
	Foolscap	9¾ × 15¼ × 3¼

A criticism of this file is that the mechanism is just as bulky whether the file is full or empty; consequently it often uses more space than the material filed. To overcome this a **Rotary Lever-arch Unit** has now been introduced, the principle of which is the circular storage of such files. This equipment is described in the chapter on Office Furniture and Equipment.

Individual or Flat Files

This file is for use on the "one subject—one file" principle. It consists of a manilla cover, fitted with thin metal prongs, usually at 8 cm. spacing, on to which punched papers are filed. It has a metal compressor bar with slides to bind the papers securely in position. It is often referred to as a flat file because it was first introduced in the days when pigeon-hole or horizontal filing was used.

There are many variants of the mechanisms in these files; in addition to the metal prongs mentioned above, they are supplied



Top: Spring Clip File; *centre:* Flat File; *bottom left:* Lever Arch File; *bottom right:* Spring Back File.

with plastic or braid-covered flexible wire; elastic cord with metal bodkins; rings; or spiral metal fitting. Other types have a spring-grip mechanism which makes them suitable for the filing of non-perforated documents.

In addition to the manilla quality, others are available with board covers, which allow longer life. Sizes are quarto and foolscap, and they are eminently suitable for shelf filing systems.

Box Files

There are many makes of this simple and convenient file, but the principle is the same in all. A book-shaped box is fitted with tabbed manilla dividing sheets printed A-Z, and correspondence is filed alphabetically between these sheets. A spring-operated compressor keeps the papers in orderly formation. The lid and one side are hinged to fall away for easy accessibility. (Papers to be filed do not have to be punched.) Alternatively, they may be without an index and with a fixed front.

The B.S.I. standard for sizes is as follows:—

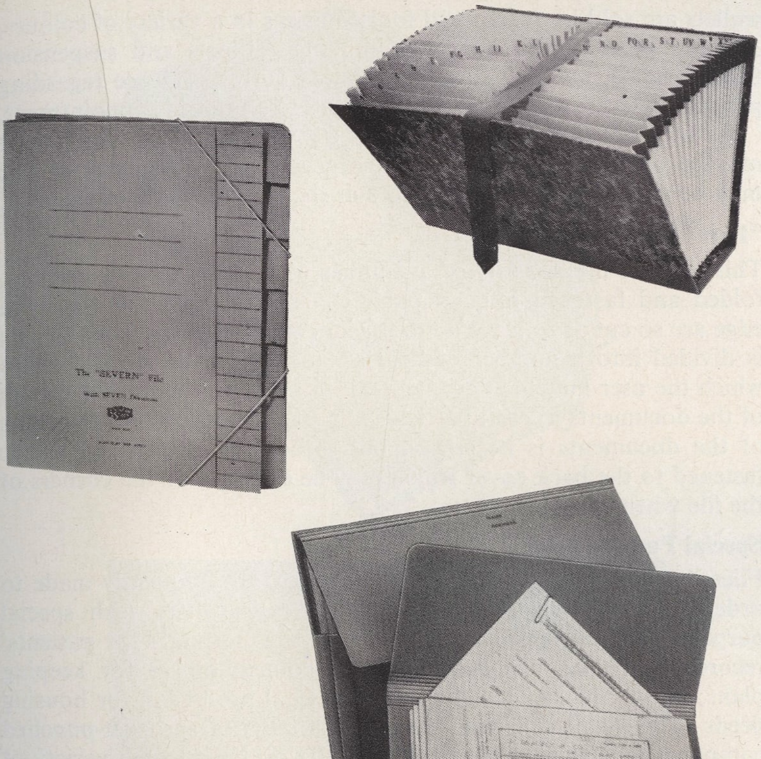
	min. internal inches	max. external inches
(i) With index and drop-front.		
Octavo	10 × 8 × 2¾	11¼ × 9 × 3
Quarto	12 × 11 × 2¾	13¼ × 12 × 3
Foolscap	14 × 11 × 2¾	15¼ × 12 × 3
(ii) Without index and with fixed front.		
3 in. Octavo	10 × 7 × 2¾	11¼ × 8 × 3
2 in. Octavo	10 × 7 × 1¾	11¼ × 8 × 2
3 in. Quarto	12 × 10 × 2¾	13¼ × 11 × 3
2 in. Quarto	12 × 10 × 1¾	13¼ × 11 × 2
3 in. Foolscap	14 × 10 × 2¾	15¼ × 11 × 3
2 in. Foolscap	14 × 10 × 1¾	15¼ × 11 × 2

Expanding Files

This is made of manilla or cloth and consists of a number of pockets or gusset divisions, tabbed with letters of the alphabet, in a bellows-like manner, which has earned it the colloquial name of "concertina file." Documents are filed loose in the pockets according to the initial letter, and the file has a protective cover or flap and a strap by means of which it can be secured when not in use. Foolscap is the most popular size, but quarto is also available.

Document Wallet

Another form of manilla filing device is the document wallet, which incorporates a gusseted pocket and has no metal fittings, so that papers to be filed therein do not need to be punched. Document


The "SEVERN" File
The Bradford Wallet

Top left: Part File; *top right:* Expanding File; *centre:* Document Wallets; *bottom:* Box File.

wallets are sold in quarto and foolscap sizes in a variety of colours, and are most useful, not only in filing cabinets and suspension filing systems, but also for accumulating correspondence regarding projects in hand, and for carrying papers to an outside appointment.

As with flat files, a wide range of styles is available. The pocket may be oblong or upright, and the gusset and the depths of flap may be of various dimensions to suit the requirements of the user.

"Part" Files

This type of file consists of a number of sheets of heavy manilla, folded and fastened into an outer cover. The leaves at the open edge are so cut as to leave a tab for indexing purposes. Thus the file is divided into a number of "parts"—usually seven or nine—into which the user may file documents, indicating on the tab the nature of the documents in each particular "part" or section. No punching of the documents is necessary. but security is effected by elastic fastened to the back cover which may be drawn over the corners of the file when closed.

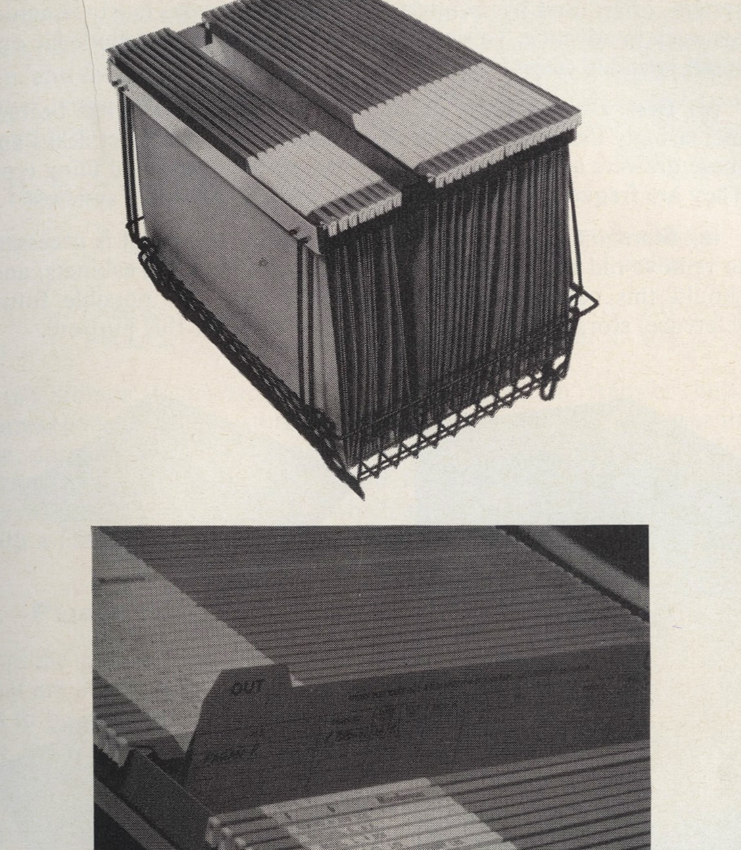
Special Purpose Files

Files, both with and without metal fittings, are frequently made to order in special size or style. Typical cases where such special purpose files are called for are: for use in hospitals for patients' records; for use by architects or in council offices for keeping plans; and by building societies or the legal profession for housing deeds of property; for the filing and storage of sprocket-punched computor stationery. There is practically no limit to the variety of special purpose files though, naturally, it is more convenient and economical to adapt a standard line where possible.

Miscellaneous Files

(a) Sorter Files: Pre-sorting documents for filing is a very sensible way of cutting down filing time and saves moving from one part of the system to the other unnecessarily. A sorting device is a simple piece of equipment, but on the larger filing installations it is almost indispensable. The illustration shows one type, usually made of metal. Another type, made from heavy manilla, is made in concertina fashion. When in use it is extended so that every division of the alphabet is open to view ready for sorting the documents.

(b) "Out" Files: It is common practice on almost all document filing systems to use some sort of indicator to show which files are out. Particularly on suspension filing, when a file is removed it should be replaced with an "out" file. The "out" file then serves as a receptacle for freshly-filed material and retains a record of the last person to use the file, when it was removed and where it can be found. When the file is returned the "out" file is "signed off" and can be used many times over throughout the system.

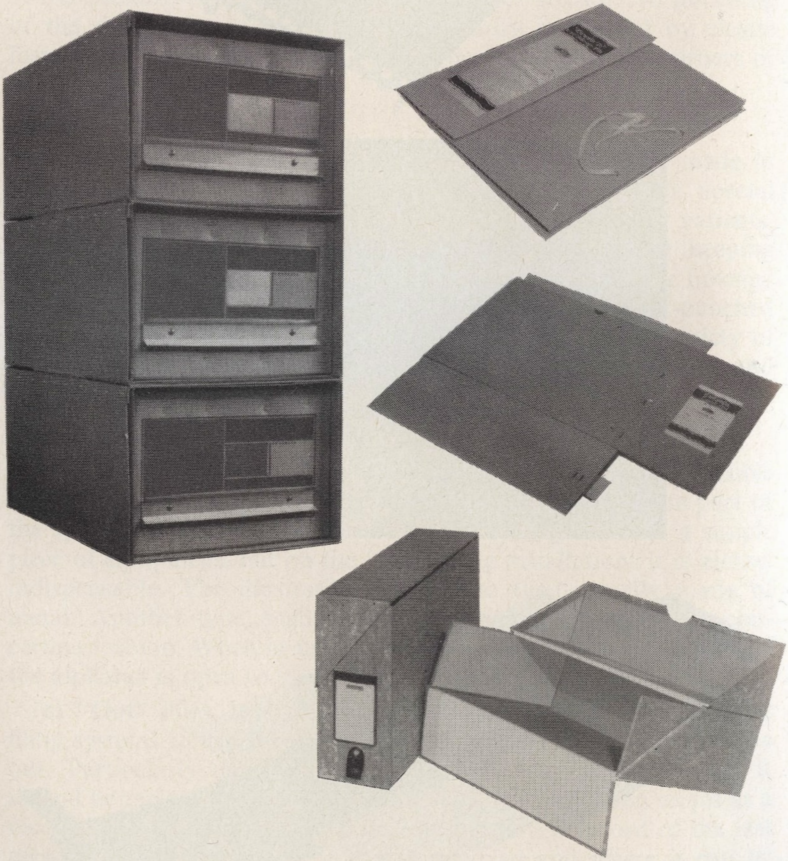


Top: Desk Organiser; *centre:* "Out" File; *bottom:* Sorter File.

(c) Desk Organizers: The desk organizer is a miniature filing system, often used by secretaries or by anyone who has to organize his work in advance. This could take the form of an envelope file or a small portable suspension file.

(d) Desk Drawer Files: During the last few years it has become increasingly the practice to fit deep desk drawers to most desks and these drawers are designed to take files of the suspended filing type. They are frequently used for all sorts of personal filing systems.

(e) Storage Cases and Cabinets: From time to time it is necessary to remove old correspondence from the current filing cabinets, and, should this correspondence have to be kept for possible future reference, storage cases, or cabinets, are used for this purpose.



Left: Collapsible Storage Cabinet; *top right:* Manilla Collapsible Storage Case; *centre right:* Rigid Collapsible Storage Case; *bottom right:* Rigid Non-Collapsible Storage Case.

(*i*) *Storage Cases:* One type is made of strong manilla, rather to a carrier bag, but with a rigid end on which a contents label is affixed, the open end having a dust-flap and tying cord. Their capacity is 4 in. and they are available in quarto and foolscap size, supplied flat. Other types, made from board are available when a more rigid case is required. These are also made "collapsible" for easier handling.

The B.S.I. standard for sizes is as follows:—

	min. internal inches	max. external inches
Quarto	12 × 10⅛ × 4¾	13 × 10½ × 5
Foolscap ..	15 × 10⅛ × 4¾	16 × 10½ × 5

(*ii*) *Storage Cabinets:* Where it is required to transfer bulk correspondence and to store it in exactly the same order as it was in the current cabinets, storage cabinets are available. Basically, these are single-drawer quarto and foolscap size made of strong corrugated board supplied flat, which are quickly assembled together with a handle "pull" at the front to assist opening and closing.

5. Plastic Files and Folders

For the purposes of this section the fancy, novelty and gift items that are obtainable will be ignored, as these are so many and various as to be impossible to cover adequately. Instead, consideration will be given to the use to the commercial stationery trade of high frequency welded plastics that may be considered as filing units.

The material used, although loosely referred to as "plastic," is actually polyvinyl chloride (PVC) sheeting. This has several advantageous properties:—

(1) It is capable of being fused (welded) electronically to itself, giving an extremely strong joint;

(2) When unstiffened, its flexibility allows it to be rolled up without cracking, and it cannot fray;

(3) It is impervious to climatic conditions, other than stiffening slightly when subjected to extreme cold;

(4) It is greaseproof and waterproof, thus being easily cleaned with warm soapy water;

(5) It has a low flash-point and will only smoulder even when subjected to a naked flame;

(6) And, perhaps most important, it has an extremely long life.

Three main types of material are commonly used in the manufacture of commercial stationery items:—

(*a*) **Transparent:** Available in glass clear and "dimpled" finishes, also in various colours. Generally used for the manufacture of folders, card holders, pockets, etc.

(*b*) **Opaque:** Available in a wide variety of colours and simulated leather-grain finishes. Generally used in making binders, wallets and miscellaneous covers.

(*c*) **Semi-rigid Opaque:** Sometimes used in the manufacture of folders in conjunction with glass clear material.

In describing the uses of this versatile material in the world of commercial stationery, it is convenient to break down the applications into several groups as follows:—

Folders

These are the most common products. They are usually made from glass clear or "dimpled" transparent plastic and are readily available in transparent or translucent coloured materials. The usual design is for the folder to be open on one short and one long side with a thumb-cut for easy opening. Sizes are available to take quarto, A4 or foolscap papers.

The main advantage over the conventional manilla folder, apart from the extreme durability, is the complete transparency, giving instant recognition of contents. The colours may be used for coding purposes. Various binding devices are obtainable for use with some folders in order that the contents may be held secure.

As already mentioned, folders are also available with an opaque semi-rigid back and glass clear front, giving the article a much stiffer "feel."

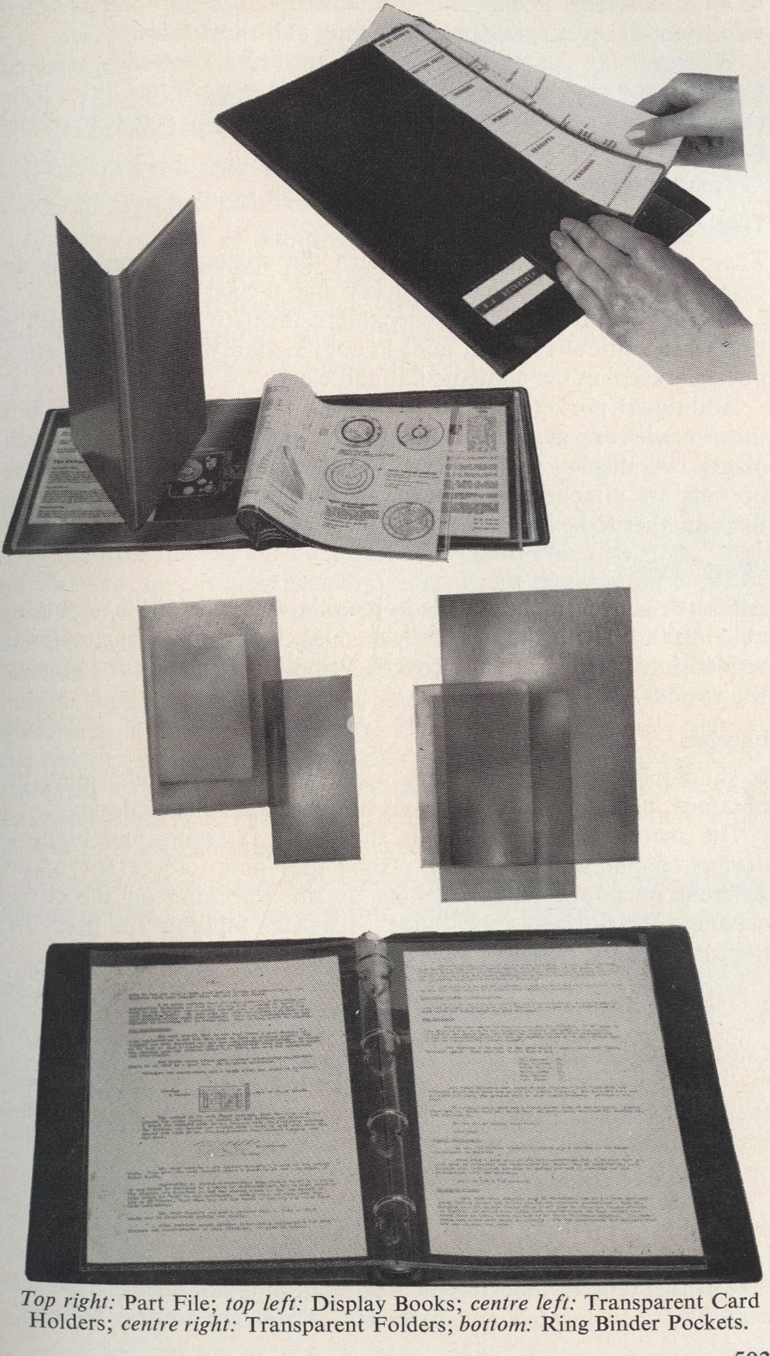
Card Holders

In sheer numbers, this is perhaps the biggest selling item of all. A card holder is usually manufactured in glass clear plastic, open on one short side with a thumb-cut, and can be obtained in a wide variety of sizes. They are also available open two sides, but to take smaller sized cards than the usual quarto, A4 or foolscap sizes.

Their main uses are the protection of job cards, works passes, progress charts, membership cards, etc.—in fact, any papers or cards that are constantly handled.

Ringbinder Pockets

Again, glass clear plastic is used to make a pocket which is punched to fit various mechanisms in common use. Sizes are available to fit octavo, quarto, A4 or foolscap binders, and unpunched papers can



Top right: Part File; *top left:* Display Books; *centre left:* Transparent Card Holders; *centre right:* Transparent Folders; *bottom:* Ring Binder Pockets.

be easily inserted. Pockets are available open on the long punched side, the top short side or on both long and short sides.

Wherever the contents of a binder are being constantly referred to—as in the case of, for example, salesmen's brochures, price lists, catalogues, etc.—pockets should be used, as wear and tear of the paper is completely obviated.

This comment applies also to:

Display Books and Binders

These have the pockets welded into the spine. The result is an extremely neat, slim cover no thicker than a cigarette packet.

The covers are stiffened, so enabling them to be slipped into a brief-case without rucking, and, in conjunction with the glass clear pockets, keeping the contents flat and clean.

Additional pockets cannot, of course, be fitted by the user, but these books are available with varying numbers of pockets, each giving two display surfaces. Other types are binders in which the pockets are attached in a variety of ways, in some cases enabling their number to be increased or decreased according to requirements.

"Part" Files

Although conventionally made in manilla, this type of file is obtainable in plastic with the insert sheets made from glass clear material welded into flexible opaque covers. Provision is made for indexing the various sections.

Specials

It should be noted that a very wide range of "specials" may be obtained, using any of the aforementioned materials or designs.

The materials, together with the many fastening and binding devices, facilitate the use of plastic files and folders for many different purposes. Gold blocking or silk screening on the cover enhances the finished appearance, as well as fulfilling the need for indication of the contents.

6. Non-visible Card Indexing

Card indexing generally is a systematic arrangement of subject matter entered on to cards. It may be a unit complete in itself, where each card contains a record of complete information, or it may be used merely as a guide to indicate where other documents or items of information are located.

The non-visible method is, as has already been stated, the traditional method. Although other methods, which will be described, have superseded it, it is still widely used. The title serves to indicate that in this type of indexing the information is not visible until the card has been located and extracted. There are several methods employed, but there are characteristics which are applicable to them all—including those which will be described under Visible Card Indexing. They are:—

- (*a*) The index need contain only "live" matter, as obsolete cards can be removed immediately;
- (*b*) New cards may be inserted anywhere;
- (*c*) Information can be easily collated and indexed;
- (*d*) Any system of sub-division and classification can be used.

Card-index systems are often used as cross-references to numerical filing systems, apart from which they can be used to record almost any type of information, under any classification system.

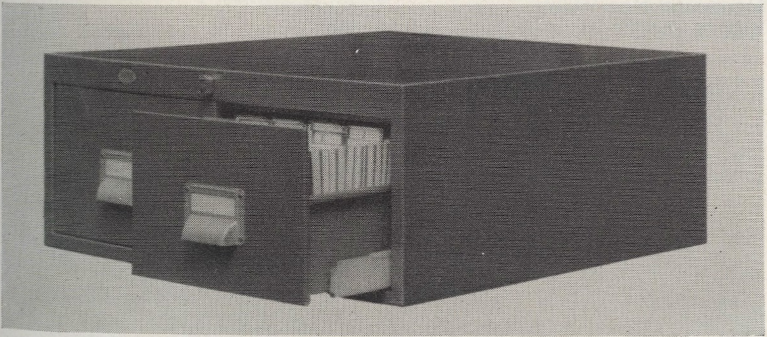
There are two principal methods used:—

1. **Vertical**;
2. **Rotary**—which can be based on either the vertical or the horizontal principle.

Vertical Card Indexing

This involves the use of the traditional "card-index cabinet," and has been in use for a good many years. From the expense point of view it is probably the cheapest method. Certainly very small outfits are available, and these are called "Trial Outfits" or "Memory Ticklers." Containing merely several hundred cards they fulfil an infinite variety of needs. As may be realized from the title, cards are filed vertically in their containers. The inherent weakness is that all the record cards are "blind"—that is to say, although matter may be classified by guide cards, no information is available until the card has been found and extracted. (This disadvantage has been overcome, as will be explained shortly). Basic requirements are:—

(a) Cards of various sizes, which may be ruled in any way to accommodate the information it is desired to record.



Vertical Non-Visible Card Index.

The popular sizes are 5 × 3, 6 × 4, and 8 × 5 in., but there is some demand for 9 × 6 and 10 × 8 in. cards. For medical and insurance work 5 × 8 in. cards are in some demand.

It must be remembered that, in stating the size, the first measurement is the breadth of the card and the second the height of the card.

For the varied functions there is available a large number of stock printed cards which meet most needs, but there are always instances when the customer will have specialized requirements necessitating special printing.

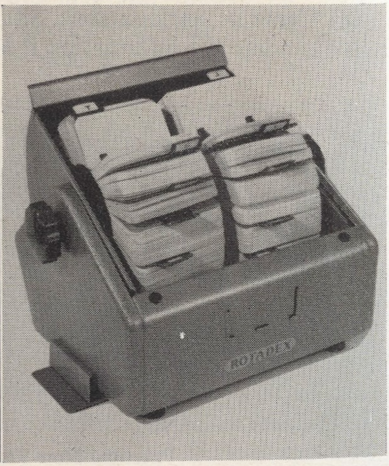
(b) Guide Cards. These are used to classify the information, and any of the systems detailed in section 2 of this chapter may be used. The guide cards or sheets are of various qualities, and the projecting tabs may be printed in a variety of ways, *i.e.*, A-Z, JAN-DEC, etc., or, by the use of plain tabs, the user may write up to his own choice. These cards, however, should be hard-wearing as they will undoubtedly recieve a good deal of wear and tear.

(c) Housing Unit. This is a box containing a drawer. It may be of board, wood or metal, in single or multiple drawer units. Sizes are available to suit the size of the record cards, and fuller details will be found in the chapter on Office Furniture.

Rotary Card Indexing

The increasing speed of office work has created the necessity for equipment which yields information at the spin of a wheel or the touch of a button. Thus cards may be housed on a vertical wheel or in a horizontal drum.

(a) Vertical Rotary Card Indexing: Cards are held in place on wheels and extracted and replaced easily by virtue of a keyhole



Vertical Non-Visible
Rotary Card Index.

Horizontal Non-Visible
Rotary Card Index.

punching at the foot of the card. Cards are available in sizes 3½ × 2, 5 × 3, 6 × 4 and 8 × 5 in., and equipment offers capacities of 500, 1,000, 1,500 and 3,000 cards. Larger units are also available with capacities of 9,000 and 18,000 cards and are worked by an electric motor. Cards can be written on in the card units as a writing tablet is provided.

(b) **Horizontal Rotary Card Indexing**: Housing cards in a horizontal wheel offers the advantage that standard stationery can be used. The main reason for the use of horizontal wheels is the desire to give access to a large number of records by a number of people without their being in each other's way. The ability to have up to 250,000 cards at one's finger tips without mechanical aid is possible under this heading.

(c) **Electrical and Mechanical Card Indexing**: It must be clearly understood that card-indexes can grow to an enormous size. For example, hospital patients' registers and motor car licence records, to name only two, nowadays often number well in excess of 100,000 cards.

For installations such as these an army of clerks is required, and the constant opening and closing of card cabinet drawers is a tiring and time-consuming operation. Recent years, therefore, have seen the emergence of various types of electrical and mechanically operated units which use the principle of bringing the card tray to the operator rather than the operator to the card tray.

These units range from the simple rotary models mentioned above to highly sophisticated electro-mechanical machines operated by the press of a button, which bring card trays to one seated operator. Safety devices are built in, and in some units it is possible to house well over 125,000 8 × 5 in. cards. These machines utilize the same methods of indexing as in normal card-index cabinets, but their virtues are that for an admittedly higher cost they cut floor space, effect savings in the number of operators required, and ease and speed the process of finding and filing vertical cards.

7. Visible Record Indexing

Visible record systems form a family of information filing units, developed from certain well-known basic types in order to house forms or cards arranged in visible fashion.

It must first be clearly established what is meant by "visible fashion." Sheets in a loose leaf binder, or for that matter, in a bound book, lie on top of one another in a block. They are bound on one edge and indexed either "through"—as in loose leaf—or at the front in a bound book style. To find any individual sheet in a loose leaf book one must first move to the appropriate index tab and then search through the sheets behind it.

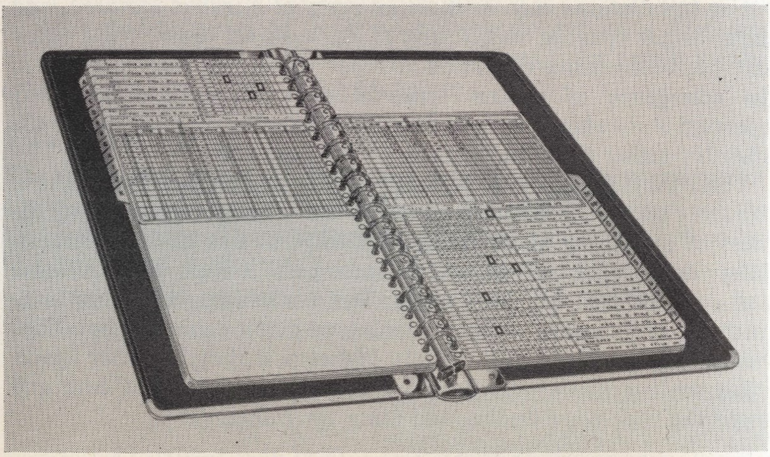
Similarly, in the card-indexing methods already described each card must be individually handled in order to find the card required.

The speed with which a form or card may be found is governed by (*a*) the index and (*b*) the speed of the searcher.

At best, this method of "finding" is of fairly low efficiency; moreover, every form completely conceals the one behind it. Therefore, information at a glance is available only from one form at a time—*i.e.*, the one on top or in front of the pile.

For many purposes this method of indexing suffices reasonably well, but where a set of records is constantly in reference—as in a stock record system—great speed of finding is essential, and this is certainly not available in a normal book or, for that matter, in a drawer of cards.

To answer this need, forms in a visible record system are arranged in rows or "banks." Such forms are usually of short depth—seldom more than 5 in. or 6 in. deep—and are laid on top of one another leaving a narrow strip of each form visible below the one above it. The illustration below shows forms so arranged, in a loose leaf visible system.



Visible Record Indexing.
(Horizontal Loose Leaf).

Thus it becomes possible to write details on this visible strip—called the **visible edge**—which will give a clear indication of the matter contained in the body of the form itself and may be used for other purposes described later in this chapter. This, then, is what is meant by visible fashion, and records so arranged are known as visible records.

Applications

Before the basic types of visible record equipment available to the trade, together with the factors which govern their size and capacity, are considered, as well as questions relating to index sheet and record form sizes, the factors which indicate a need for a "visible" type record must now be set out. They are:—

(*a*) A multiplicity of individual records.

(*b*) A need for *speed* in finding any one form or card.

(*c*) Detail requirements which may be compressed into a small, carefully designed form where use may be made of selected data on the visible edge, giving the reader a quick, clear indication of the situation described on the form itself. This is a vital criterion. Most of the value of a visible record is lost if it cannot be fulfilled.

Typical applications which fulfil some or all of the above requirements are:—

(1) stock records;
(2) hire purchase records;
(3) personnel records;
(4) sundry ledgers;
(5) plant and machinery records;
(6) customer records.

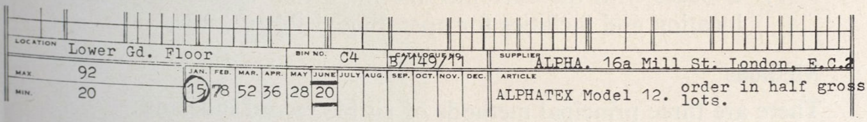
It has been seen that visible record equipment consists of an index and a quantity of overlapping forms or cards.

To find any given form, the first reference must be to the index which indicates the section of the outfit in which the form is housed. Therefore very careful consideration must always be given to the indexing itself. It must take the operator as near to the form he requires as is possible.

Behind each index tab lies a bank of forms, each with the *visible edge exposed.* Thus the forms themselves become a sub-index as up to 30 or more may be seen at a glance.

It is, therefore, important that the actual arrangement of the forms behind the index tab is meticulous and follows a plan which is blueprinted, so to speak, by the layout of information on the visible edge. It could be said that the success or failure of a visibel record system may be judged in large part by the number of times it is necessary to look beyond the visible edge for information.

A typical visible edge is illustrated below. It refers to a stock record and shows in one short line:—



LOCATION Lower Gd. Floor
BIN NO. C4
CATALOGUE NO. B/149/11
SUPPLIER ALPHA. 16a Mill St. London, E.C.2
MAX. 92
MIN. 20

JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
⑮	78	52	36	28	20						

ARTICLE ALPHATEX Model 12. order in half gross lots.

Typical Visible Edge Layout.

(1) the name of the article;
(2) the minimum and maximum stock levels;
(3) the unit of order;
(4) the model number;
(5) the month of last order;
(6) a signal showing that delivery is protracted.

Item 6 above mentions the use of a signal. Because there is a visible edge to each of the forms, it is possible to use coloured signals to draw the eye to any one record for a specific reason. When many records lie at view the proliferation of a particular signal may also have a significance. A visible record, therefore, not only presents basic information to the eye, but can *comment on it*. The reader may then take appropriate action without necessarily referring to the body of any particular form.

Visible record forms for a wide variety of purposes are offered as stock designs by most manufacturers supplying the trade. Nevertheless, it is often the case that stock designs do not fill a requirement, and the stationer is called upon to design a "special." There are certain simple rules which he should follow. He should:—

(1) Take time to consult with the customer. Hurried consultations bring poor results.
(2) Study the existing record if there is one, and endeavour to dispense with inessentials. Remember that all the information has to end up on a small form seldom larger than about 5 in. × 10 in.
(3) Ascertain the detail which, used on the visible edge, will tell the most useful story to a reader.
(4) Not be afraid of reducing column widths to an absolute minimum if necessary. Users often have an exaggerated idea of how wide a column they really need.
(5) Remember that the main index in the system is a vital link in the "finding" chain. It should relate to the information on the visible edge of the record forms. Therefore, index and form design must be considered together.
(6) Find out *who* will use the record, *where* it will be used and *what* sort of handling it will receive.
(7) Discuss with the customer the important matters of proper location and facilities for operating visible records.

Methods

There are three principal methods of visible record indexing:—

(1) **Horizontal Visible Card Indexing**;

(2) **Horizontal Loose Leaf Visible Indexing;**

(3) **Vertical Visible Card Indexing.**

Horizontal Visible Indexing

Visible card cabinets utilize flat trays in which cards are filed horizontally with the lower edge of each card visible. The cards are kept in position by various devices and the trays are supplied in "build up" interlocking units or in fixed capacity cabinets containing six or more trays. The usual sizes are 5 × 3, 6 × 4 and 8 × 5 in.

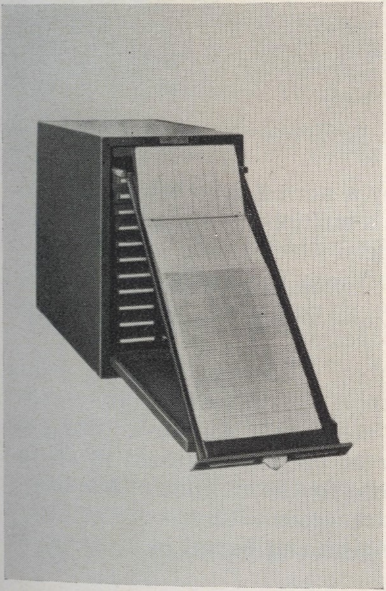
A popular method of housing these visible records is to fit the trays with acetate-edged kraft pockets of great strength and durability. The advantages of these visible card records are as follows:—

(*a*) There is an enormous saving of time in locating records by reason of their visible formation;

(*b*) All cards are fully accessible and entries can be made on the front or the back of cards without removing them from the tray;

(*c*) Any card can be instantly removed for appropriate action;

(*d*) The acetate edge permits simple signalling, with either removable or sliding telescopic signals in various colours. These signals are used to "flash" vital information, or for sub-dividing purposes;



Horizontal Visible Card Indexing.

(*e*) By means of folded supplementary (or overriding) sheets, a whole series of related or historical information can be housed in the one pocket, thus making all relevant information available at one reference point.

The value of visible card records is enhanced by the use of title slips which remain permanently in the acetate edge of the pocket. Thus when a card is removed for action its return to its correct place is assured. The cards themselves should be designed so that the titled portion is at the foot. It is also useful to include titling at the top for use when cards are transferred to storage cabinets.

A useful development of visible card records is the **Book Unit**. There are many facets of modern business control where records are of vital importance yet not numerous, and that is where book units come into their own. Such records may be confidential, and a book unit is easily housed in the filing drawer of the executive's desk. Typical examples where the book unit is specially applicable are for records of insurance policies, building maintenance, office machinery or plant records, sales prices, contracts, etc.

Horizontal Loose Leaf Visible Indexing

The visible record method is admirably suited for use in loose leaf binders, and for convenience these are included in this chapter.

Visible record binders fall into the four main types listed below, the first two of which are available to the stationer from trade manufacturers, and these only will be described:

(1) the Multiple Ring Binder;
(2) the Multiple Prong Binder;
(3) the Multiple Post Slide Bar Binder;
(4) the Thong Binder specially adapted.

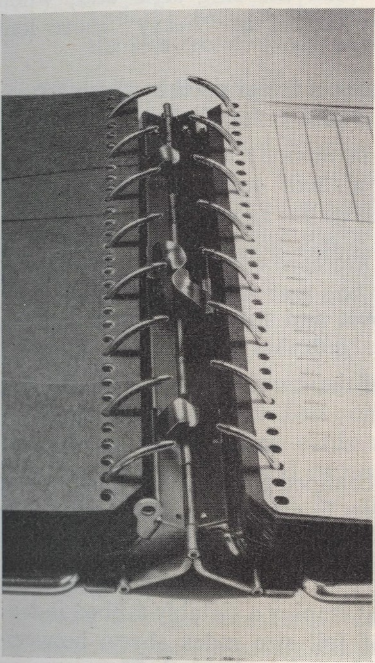
Forms used in all these binders are multi-punched along the edge as shown in the sketch.

(*a*) **Multiple ring binders** employ a normal type of ring metal—often trigger-operated—which has a multiplicity of rings set usually at $\frac{3}{4}$ in. centre to centre down a metal which houses an index sheet 14 in. deep. Ring capacity varies between 1 in. and $1\frac{1}{2}$ in.—300-500 visible sheets. Covers are of light-weight rigid board bound according to the habit of the manufacturer concerned.

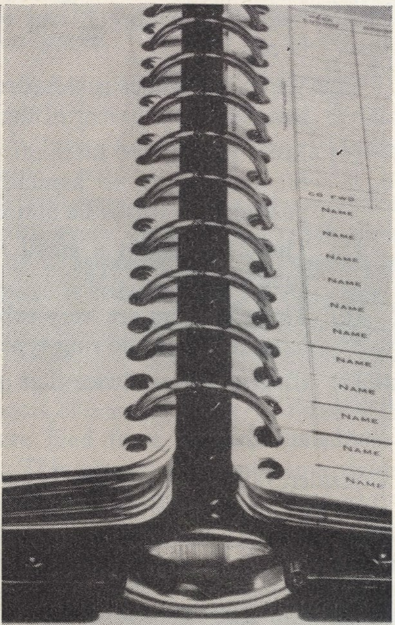
(*b*) **Multiple prong binders** employ a specially adapted prong mechanism which, as well as containing a multiplicity of prongs, also has a "shift device" built into the mechanism, this device being an arrangement whereby spaces may be opened or closed in an incomplete bank of forms, thus allowing for the insertion of new forms wherever desired in the existing arrangement. Covers are of heavy boards metal hinged to the mechanism and bound in a variety of ways.

Characteristics

Illustrations of each of the mechanisms are shown below. Manufacturers claim certain refinements and advantages for their own mechanisms, but basically all mechanisms are similar. All carry banks of forms in visible fashion and all have certain common characteristics. The student must have these characteristics well in mind and they are listed hereunder:—



Multi Prong.



Multi Ring.

Multi-Ring Type Visible Record Binders

(1) All are of fixed capacity.

(2) All are light-weight binders not suitable for very heavy work.

(3) Forms are not gripped by the mechanism. Therefore, only high-grade paper should be used. If this precaution is neglected, forms will wear at the punch holes and ultimately tear out.

(4) These binders are easily portable as capacities are small and covers are light.

(5) A completely flat writing surface is available, as in all ring books.

(6) Very little binding margin on the sheet—½ in. to ¾ in.—will suffice.

(7) Cost is low.

Multi-Prong Type Visible Binders

(1) All are of fixed capacity approximately double that of the largest multiple ring metal.

(2) Binders are much heavier than the ring style and, when loaded with sheets, can be classed as "heavy" loose leaf books.

(3) When the binder is closed, sheets are gripped by the mechanism and do not wear at the punch holes.

(4) Most prong-type mechanisms embody a catch which allows the mechanism to assume a "half open" position. In this position the forms lie almost as flat as with the ring style.

(5) Therefore, again a small binding margin—½ to ¾ in.—will suffice.

(6) These binders are very robust and will stand much heavier handling than the ring type.

(7) Cost is at least twice that of the multiple ring visible binder.

Forms and Indexes

Consideration has up to now been confined to the actual binders and the mechanisms used to house sheets in a visible fashion. Although these mechanisms are vastly different one from the other, there are certain common factors in regard to their contents. These are:—

(1) All visible record outfits must employ a suitably tabbed index. This consists of a series of full size index sheets between which the banks of visible forms are housed. They occupy the full depth of the mechanism and vary in width according to the width of the visible form in use.

Common visible form sizes are: 3⅛ in. × 5¾ in., 4¼ in. × 6½ in., 5 in. × 8½ in. and 4⅝ in. × 10⅜ in. Thus with a form size 5 in. × 8½ in., the *index* sheet in the binder would measure 14 in. deep—the depth of sheet that the mechanism will carry—by 8½ in. wide—14 in. × 8½ in.

(2) When considering the contents for any visible record binder, therefore, two sheet sizes are always quoted, that of the index and that of the visible record form itself.

(3) The depth of the visible edge on the visible record form is standard for all manufacturers at ⅜ in. This is dictated by the centre to centre of the rings or prongs. It follows that visible

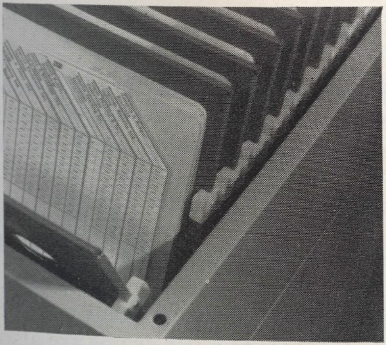
sheets for all types of binder can be varied in depth only by using multiples of $\frac{3}{8}$ in. Greater or lesser visibility can be obtained only in the same multiples.

(4) The depth of a visible form dictates the number of forms (and thus the number of visible edges) to a bank of sheets. Further, it dictates also the actual number of forms that may be housed in a binder, though the number of index sheets also has a bearing on this. The deeper the form, the less at view and the less in the binder. The more index sheets used, the less record forms in the binder.

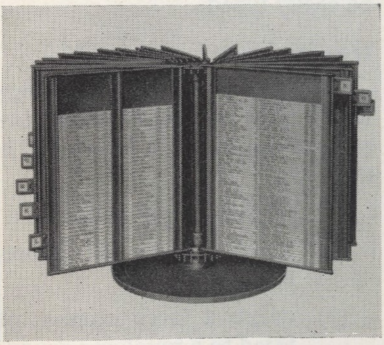
"Cabinet card visible" has already been considered in this chapter. Both this and "book visible" perform similar jobs and certain advantages are claimed by manufacturers for each. It may be fairly said, however, that "book visible" economizes considerably in office space. It will allow some 10,000 records to be accommodated in the width of an office desk, with every outfit within reach. It is also very portable; it will house up to approximately 750 records in one binder. Storage is easy and price is considerably lower.

Vertical Visible Card Indexing

In recent years another type of equipment embodying the visible principle has appeared. This consists of a metal card tray fitted with separators along which cards are filed from right to left, overlapping on the right-hand corner. This corner is trimmed to provide indexing media—*i.e.*, Part No. or Name. The cards are punched on the lower edge and positioned on wire or rods in the card tray. The exposed edges of these cards are not protected, so that signalling is somewhat limited, but this method does provide a means of housing a larger number of cards in a smaller area than in the horizontal type previously discussed, and at less cost.



Vertical Visible Cards.



Visible Strip Index.

Variations of this method provide means of producing the visible edge in slightly different ways, but performing the same function.

8. Visible Strip Indexing

This form of visible recording is used where the information is brief, but nevertheless is required for frequent reference. The information is written or typed on thin strips of card, which are then inserted into the housing unit. Obsolete information can easily be removed and replaced with up-to-date information, and new strips can be added with equal facility. Consequently the index is always current and free of erasures, crossings out and alterations. Any method of classification can be used and, with the use of signals or different coloured strips, rapid reference can be made to a vast number of items contained in a very small space.

Applications

The uses of strip indexing are almost inexhaustible, but a few of the more usual are:—

(1) Names, addresses and telephone numbers;
(2) Price lists;
(3) Personnel location;
(4) Overdue accounts;
(5) Book titles and authors;
(6) Cross-indexing.

Index Strips

These are available in various widths and colours. They are supplied in "belts"—*i.e.*, so many strips lightly secured to a backing strip, which facilitates the typing of the information. The belt has a paper extension at each end so that the first and last few strips can be easily typed.

Housing Units

(a) Panel Type: Here the strips are mounted on flat metal panels which have narrow channels down the outer edges, into which the ends of the strip are inserted. The panels can be mounted in one of three ways:—

(1) for free-standing use on a desk;
(2) for permanent attachment to a wall by means of a wall bracket;
(3) where a large number of panels is involved, they can be fitted to a revolving drum. In this case two-tier drums are also available.

(b) Book Type: Similar methods of attaching the strips are involved, and, although it is not possible to house large quantities of strips, there is the advantage of portability and storage in cupboards or safes etc.

9. Signals

No matter how carefully one classifies a filing system, there is always the need for additional signalling to draw particular attention to any given file for one reason or another. Signals are mainly applicable to information filing, and a few examples of common uses are:—

Salesmen's calls and reports;
Overdue accounts;
Overdrafts, expirations or lapses;
Stock control;
"Due" indicators in library systems;
All follow-through systems.

There are many standard types of signals—lettered, numbered, coloured, projecting, telescopic, etc. Certainly no visible card-index system is complete without them and their usefulness is out of all proportion to their cost.

Further details will be found in the section of this book dealing with Filing and Card-Index Accessories.

CHAPTER II

Printing Processes

Much of the stationer's merchandise is printed and, in addition, he is often asked by customers to supply specially printed articles to order. The stationer should, therefore, possess a general understanding of printing processes and materials to enable him to advise customers who require printed matter, and to order printing on their behalf so that the result will please and satisfy them.

This chapter aims at providing a broad outline of printing processes to help in both those respects. It is written, so far as possible, in non-technical language, and condensed into a comparatively few pages, so it is obviously not exhaustive. Those who desire to make printing a special study must refer to other volumes.

Classification of Printing Processes

With few exceptions all printed matter is produced by one of the following processes:

Letterpress or relief (printing directly from raised surfaces).

Lithography or planographic (printing directly or indirectly from flat surfaces).

Intaglio processes (printing from the engraved recesses of cylinders, blocks and plates).

Die-stamping.

Thermographic printing.

Screen printing.

Flexographic printing.

1. Letterpress Printing

Letterpress printing from movable type was invented by Gutenberg, a German, in the early fifteenth century. It is used for newspapers, some periodicals, nearly all books, and many kinds of commercial stationery.

This method involves printing from a raised surface of type, or of line and half-tone blocks. It is the traditional method for printing any work in which type-matter predominates, as it allows for alterations and corrections to be made fairly easily and enables duplicate plates, if required, to be produced quickly and economically.

Letterpress printed matter can be identified because the impression of type and illustrations on the paper is clean and sharp in outline, there is a thickened edge to the letters where the ink has been squeezed out slightly under pressure, and the work is impressed into the paper, this impression appearing to some extent in reverse on the other side of the sheet.

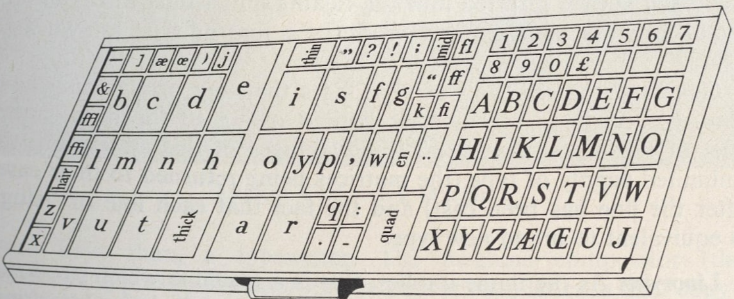
Composing the Type

Any job of printing, by any process, begins with the customer providing the wording which he wishes to have printed, and, where applicable, the originals of the illustrations which have to appear with it.

"Copy" should always be carefully prepared, preferably typewritten, on one side only of each sheet, which should be numbered consecutively. Paragraphs should be marked, or clearly indicated by indentation. The lines of the copy should be spaced for clarity (double-spaced if typewritten) and to enable final corrections to be made easily. It should be remembered that "second-thought" alterations made to the proofs which the printer supplies have to be paid for by the customer, and corrections of this kind can be very expensive.

Decisions as to type, sizes and the like should be made in consultation with the printer and, in case of doubt, referred back to the customer before the job is started.

All type in letterpress printing (except for words printed from blocks, as is later explained), and for printing by other processes, is "set" by hand or by machine. In hand setting (or "composition") the compositor has the copy before him and takes the letters required from a "case," which is a tray or drawer divided into little open boxes each accommodating a number of pieces of type for one letter,



Type Case showing Arrangement of Type.

figure or punctuation mark. Oroginally two of these cases were set up before the compositor, one above the other, the upper case containing the CAPITAL and SMALL CAPITAL letters and the lower case containing the small letters. This gave rise to the use of the terms "upper case" and "lower case" for capital and small letters respectively. The lower case also contained punctuation marks and spacing material.

With the development of machine setting the need for large boxes of type has disappeared, and a double case which contains both capitals and lower case is generally used.

Except in special circumstances, hand setting is used only for small work such as letterheads, billheads, invitation cards, etc. and for display advertisements in journals and magazines.

In the case of handset type, it is usual after the job has been printed to return the type to the type case for use on subsequent work; this operation is known as "dissing."

If "reprints" of the original order are likely to be required at regular intervals, the type may be kept "standing." This saves the cost of composing on the subsequent orders although a small charge is usually made for storage of the type.

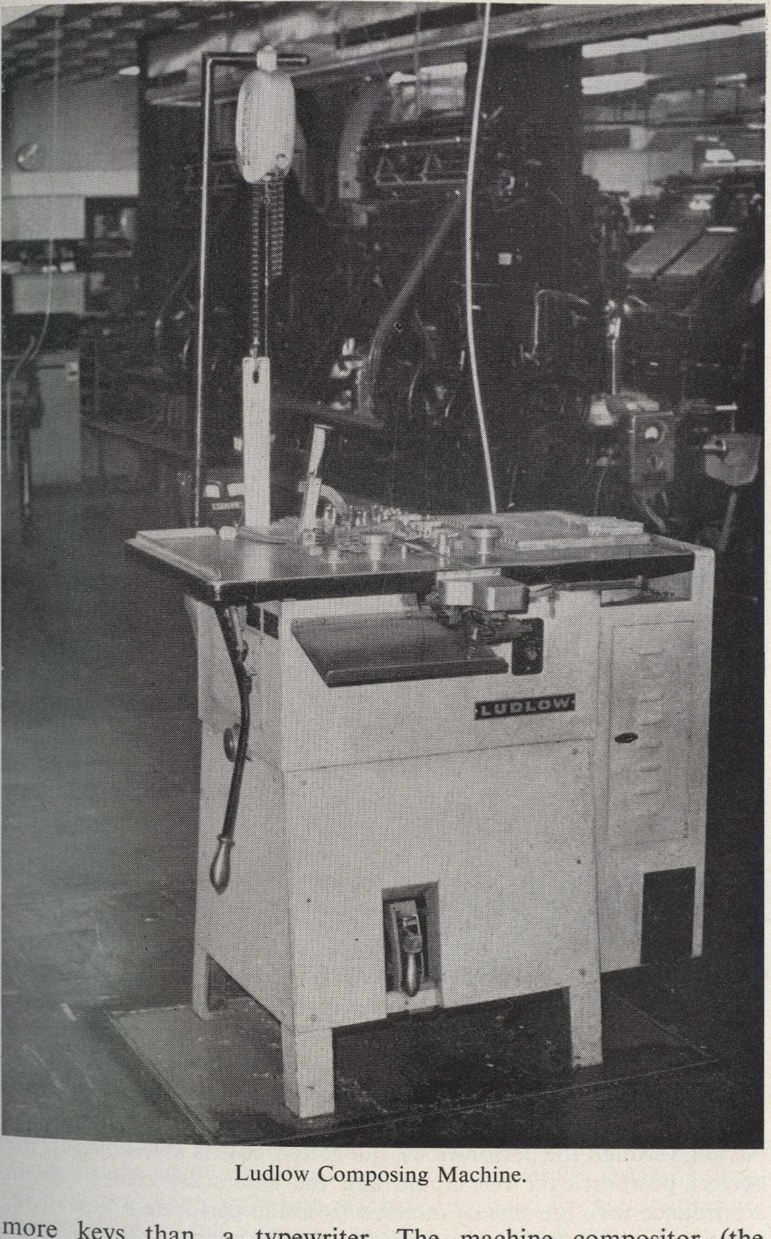
Composing Machines

As well as setting type by hand, mechanical methods of composition are also used. These greatly increase the speed of type setting, in addition to which, they employ freshly cast type for each job. This obviates defects and difficulties sometimes experienced with using worn foundry type.

Ludlow and Nebitype: These are the simplest forms of composing machines. They may be termed semi-mechanical as there is a casting unit but no keyboard. The type matrices are made of a brass alloy, each one having an impression of an individual letter. These are assembled and spaced out by hand in a special composing stick. The stick is then inserted into the casting unit which forces molten metal into the matrices and produces a line of type known as a "slug."

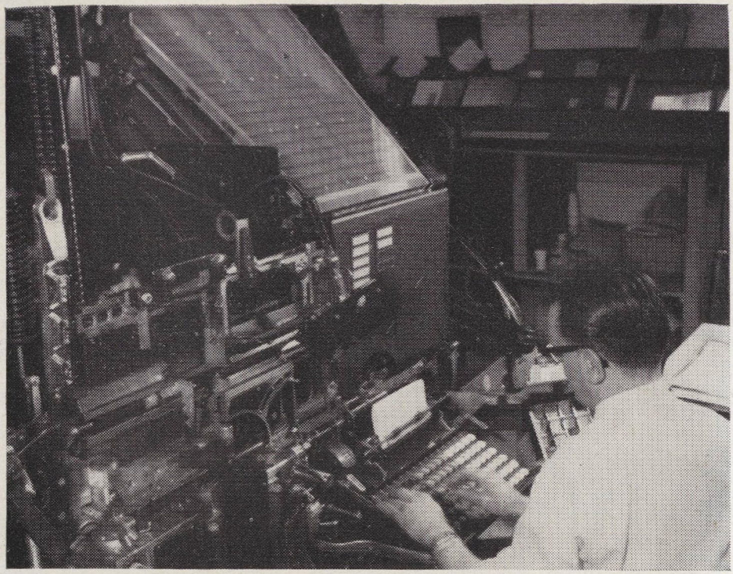
Generally the selection of type faces that any printer may have available on these machines is limited owing to the high capital cost of the brass matrices. The advantages of this system are the unlimited supply of type (the matrices being returned to their cases after the line has been cast) and the fact that each line or "slug" is equivalent to brand new type.

Linotype: As the name implies, this is a machine which produces lines of type. An almost identical machine is called the Intertype. Both these machines have a keyboard similar to, but containing



Ludlow Composing Machine.

more keys than, a typewriter. The machine compositor (the "operator") presses the appropriate key for each letter in the "copy" and as he does so a "matrix" or piece of brass, bearing the letter engraved into its narrow edge, is released from a "magazine"



Intertype Composing Machine.

containing several of each kind, and each matrix is in turn assembled in a line. Space bands—pieces of metal which can be expanded in width by means of two thin sliding wedges—are inserted so as to separate the words in each line of type. When each line is completed, a lever is depressed and the line of matrices is taken to the front of the mould, where molten metal is pumped through the mould into the matrices; after a very short delay the line of type is then ejected on to the awaiting galley. The matrices and space bands are then automatically distributed back into their appropriate containers while the next line is being set.

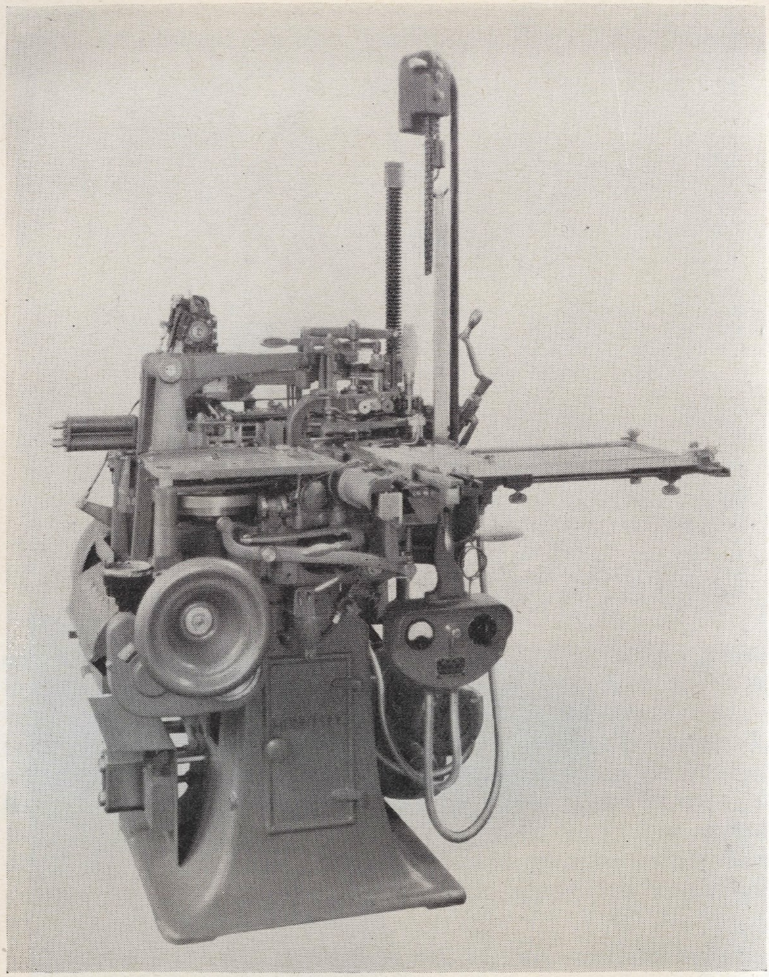
Monotype: These machines consist of two separate units, a keyboard and a casting machine. The keyboard is similar to that of the line composing machine except that is has many more keys. As the operator taps each key, two holes are punched in a long ribbon of paper, each letter having its own combination of holes. After the appropriate number of lines have been set, the paper ribbon or spool is placed on the casting machine where, by means of compressed air passing through the perforations, the matrix case is assembled in the correct position over the mould and the letters are cast singly in accordance with the signals received from the perforated paper roll. The words are built up letter by letter and line by line until the galley is complete.

The essential difference between the two kinds of composing machines is that, whereas with the Monotype system it is possible to

Monotype Keyboard.

make corrections to each line by hand, with the slug composition it is necessary for the line to be reset and recast on the actual machine itself.

The choice of which machine to use depends largely on the type of work produced by the actual printer, but, generally speaking, it can be said that line composing machines are used for newspapers and for work where it is necessary to have the type set very quickly, and the Monotype machine is used mainly on book work and journals where a number of special letters or signs are required—*i.e.*, chemical and mathematical typesetting.



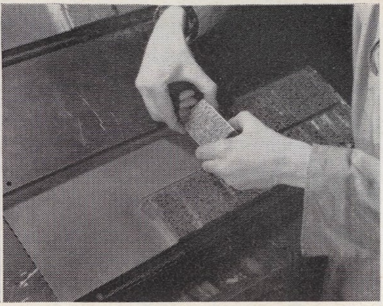
Monotype Casting Machine.

Various machines are now available for setting type by photographic means. These machines, which can be used in conjunction with computers for automatic justifying—*i.e.*, spacing out the words to make all lines of equal length—are extremely expensive and are of use for specialized work.

Proofing

After the type has been set, by hand or by machine and the required spacing has been inserted between the lines, a "proof" is taken to check for any inaccuracies.

Proofing Press.

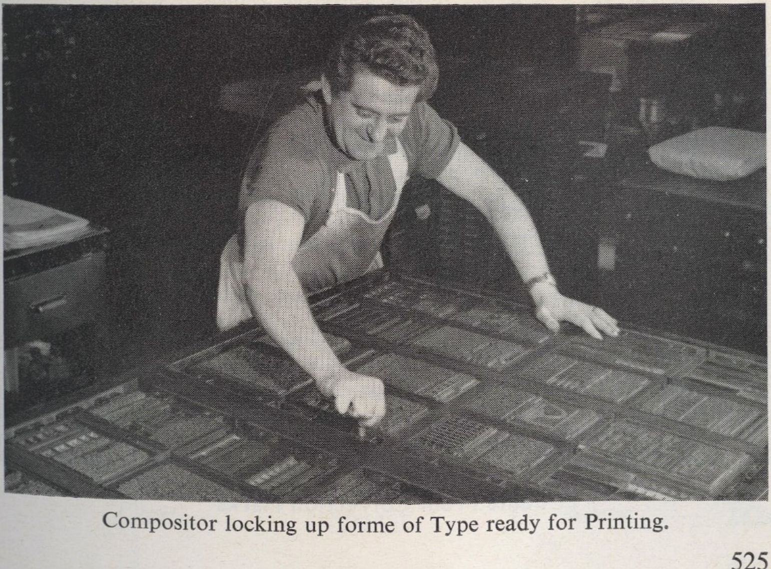


Compositor Making up Page of Type.

Proofing presses vary in method; the illustration shows a self-inking cylinder type press in common use. The type is placed on the bed of the machine on a steel tray, known as a "galley," the inking rollers are pulled across the type to deposit a thin film of ink on the type and illustration blocks, a piece of paper is laid on the type, and the cylinder is pulled across, pressing the paper on to the inked type to give a print.

The proof and the original copy are then compared by the printer's reader, who indicates any mistakes in spelling or in spacing by using the conventional signs shown on pages 526 and 527. A more detailed list is given in the appropriate British Standards publication which also gives advice on preparation of copy.

A knowledge of the kinds of signs used and recognized by printers and compositors is essential when correcting proofs. These proof



Compositor locking up forme of Type ready for Printing.

Mark in Margin	Mark in text	Meaning
Cap.	$\underline{\underline{\underline{\text{c}}}}$	Change to capital C
S.C.	═	Change to small capitals
;/	/	Replace colon with semi-colon
stet	~~alphabetical order~~	Leave as printed
9	(ə)	Inverted letter; reverse
X	(T)	Broken letter
⊙	⁁	Insert full point
⌒‿	⌒‿	Remove space and close up
#	⁁	Insert space
⊥	(▮)	Push down space
□⁁	⊏	Indent one em
(:)	/	Replace full point with colon
□□⁁	⊏	Indent two ems
rom	(*ideas*)	Re-set in roman type
‘⁁	⁁	Insert inverted comma
run on	⁀	No fresh paragraph here
’⁁	⁁	Insert apostrophe
trs	⊔⊓⊔	Transpose the order of words
(⌒-‿)	⌒-‿	Delete hyphen and close up
take over	⊏	Take over into next line
spell out	(2)	Replace numeral with the word ‘two’
≡	≡	Correct horizontal alignment
||	||	Correct vertical alignment
ital	$\underline{\text{Present}}$	Re-set in italics

Some Proof Correction Marks

C/

INTRODUTTION

THE PRESENT WORK is intended to supply, with respect S.C.
to the English language, a desideratum hitherto un-
;/ supplied in any language/ namely, a collection of the
words it contains and of the idiomatic combinations
peculiar to it, arranged not ~~in alphabetical order~~ as they stet
are in a dictionary, but according to the ideas which they rom
express. The purpose of an ordinary dictionary is
simply to explain the meaning of the words; and the 9 out
problem of which it professes to furnish find its significa- see copy
tion, or the idea it is intended to convey. The object X
aimed at in the present undertaking is exactly the
converse of this: namely,—The idea being given, to find fi
the word, or words, by which that idea may be most fitly
⊙ and aptly expressed For this purpose, the words and
phrases of the language are here classed, not according
to their sound or orthography, but strictly according to
ᵛ ᵛ their signification.
The object I have proposed to my self in this Work ⊂
would have been but imperfectly attained if I had
# confined myself to a merecatalogue of words, and had
omitted the numerous forms of expression and phrases trs
composed of several words, which are of such frequent
use as to entitle them to rank among the constituent
parts of the language. Very few of these verbal com- ⊥
δ binations, so essential to the know-ledge of our native
tongue, and so profusely abounding in its daily use, are
to be met with in ordinary dictionaries. These phrases
and forms of expression I have endeavoured dili- take over
gently to collect and to insert in their proper places,
under the general ideas that they are designed to convey.
□ In many cases, 2 ideas which are completely opposed spell out
to each other, admit of an intermediate or neutral idea,
equidistant from both; all these being expressible by cor-
take back responding definite terms. Thus, in the following
examples, the words in the first and third columns, which
—— express opposite ideas, admit of the intermediate terms
—— contained in the middle column, having a neutral sense
(:) —— with reference to the former

□□ *Identity* *Difference* *Contrariety* ||
Beginning *Middle* *End*
Past Present *Future* ital

corrections should be made correctly, cleanly and neatly. After they have been made the type is either proofed for the customer to check or made up into page form and proofed again.

Locking up and Imposition

Type and blocks are now made up into a "forme" by locking up in a metal frame called a "chase," non-printing areas of the chase are filled up with wood or metal "furniture" and the forme made secure by the insertion of wedges and expanding devices known as "quoins." The forme is then ready for the press, or used to make duplicate plates in the foundry.

"Imposition" is the arranging of all the pages to be printed on one side of a sheet, so that they will be correctly spaced and in the right sequence when the sheet is folded. There are many ways the pages can be arranged dependent particularly on the plant available.

Illustrations for Letterpress Printing

The earliest form of illustration was reproduced from engraved wooden blocks. A suitable piece of boxwood was carefully levelled and smoothed, the design was drawn in reverse, and then an engraver cut away all that part of the surface which it was not required to print. The block was then inked and paper was pressed on to the surface to give an illustration comprising solid areas and lines of varying thickness. A similar type of illustration can also be obtained by using a smooth piece of linoleum.

Today almost all blocks used for illustrations in letterpress printing are produced by specialist blockmakers by the photo-engraving process. These blocks are of two kinds, line blocks or half-tone blocks.

Line blocks: These are used to produce illustrations composed of lines and solids with no variation in tone. It is possible to introduce some shading and variation by means of mechanical tints laid down by the blockmaker on to the metal, or by the use of self-adhesive tints placed on to the drawing.

Briefly, the method of making a line block is for a reversed negative of the drawing to be made and then placed in close contact with a sheet of zinc or magnesium which has been coated with a light-sensitive solution and exposed to a bright light. The action of the light is to harden the coating where the light passes through the negative, but the coating remains soluble in the non-exposed areas. The sheet of metal is then placed in an etching machine where chemicals act on the metal, etching away the unexposed areas to a suitable depth to produce a relief printing plate.

Examples of line blocks are the diagramatic illustrations of the various types of printing machines shown on pages 532 and 533.

Half-tone blocks: These are used for the reproduction of photographs and are able to produce all the graduated tones from solid black to white.

To produce the graduated tones from black to white on a half-tone block it is necessary to break down the image into a series of dots by the use of a screen. This screen is a sheet of glass which has ruled on it a large number of lines at right angles to one another and is placed in the camera between the original photograph and the photographic material. When the light passes through the screen it is broken up into a series of dots, large ones where the light is strongest and small ones where the light is reflected from the dark parts of the photograph. The resultant negative is developed and printed down on to a sheet of copper; as the photographic process reverses the operation, the lightest areas print down as small dots and the darkest areas as almost solid copper.

Half-tone blocks are used to print on a variety of papers from newsprint to the best coated art paper, and it is therefore necessary to be able to use different screens or spacings between the dots to achieve optimum results. Screens for coarse newsprint will have as few as 55 lines to the inch, whereas for best art paper screens of 150 lines or even 175 lines to an inch can be used. Before blocks can be ordered it is essential to know the type of paper being used.

In the majority of cases, half-tone blocks are "squared up," *i.e.*, the screen background is cut with straight edges; "cut-out" half tone blocks are those which have the background cut away. The latter are the more expensive as they involve additional hand engraving around the edge of the illustration.

Examples of both types may be found on pages 533 and 534.

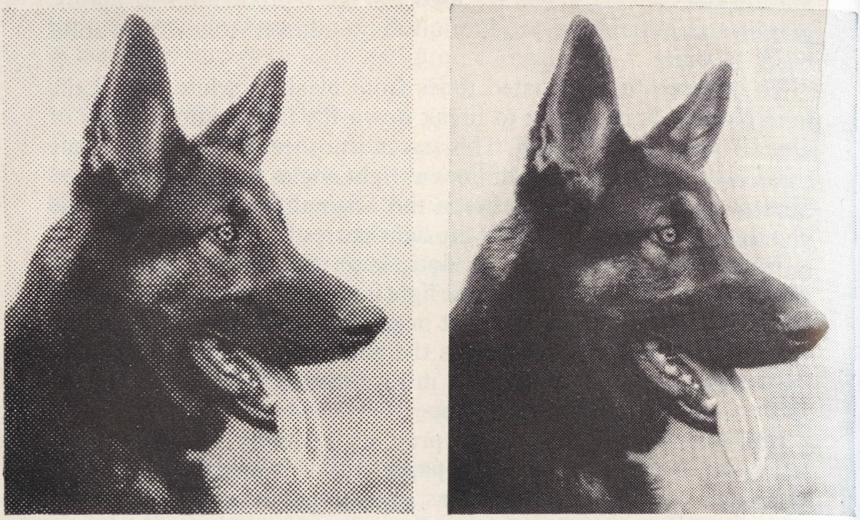
To calculate the dimensions of a line or a half-tone block the following simple and accurate method can be used:

Draw on a piece of paper to the exact measurements an accurate outline of the original. Then draw a line precisely from the bottom left to the top right-hand corner.

To determine the width of the block when the depth is known measure the depth up from the bottom left-hand corner and mark the left-hand side accordingly; then draw a line across from left to right from the edge to where it meets the slanting line. This must be exactly parallel to the base line. The distance from the side line to the slanting line will be the exact width of the block.

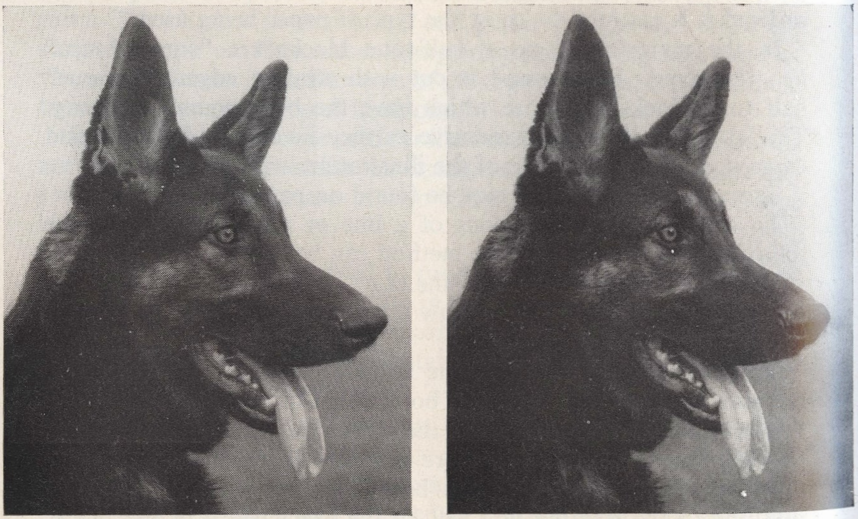
To calculate the depth where the width is known reverse this process.

To calculate the size if the block is to be made larger than the original, extend the slanting line beyond the outline of the original and extend the base line (if the width is known), or the left side (if the depth is known), and complete the enlarged shape. This larger rectangle is then the size of the block.



55-screen

85-screen



120-screen

150-screen

Examples of Squared up Half-tone Blocks of different screens.

When handling drawings and photographs for block making, great care should be taken to avoid creasing or marking, any instructions as to size etc. being written on a separate piece of paper and pasted on to the back of the original.

Letterpress Colour Printing

Colour illustrations in letterpress printing are produced by both the line and half-tone processes. Line illustrations can be printed on almost any kind of paper, but colour half-tones can be reproduced only on coated papers.

Colour Work in Line: In the case of line illustrations the same limits as to tone variations apply as to single colour printing; therefore each colour used will appear in its full density and it is not possible to vary the shade except within very narrow limits by the use of tints. The cost is, of course, much greater than for single colour printing, as each colour will require its own block and the paper will have to be passed through the printing machine for each separate colour.

Colour Half-Tone: Colour photographs or paintings are reproduced by the four colour half-tone process. All colours are a mixture of the three primary colours, yellow, red and blue, and by making a block of each primary colour content of that colour in the original and by printing one on top of the other it is possible to get a close reproduction of the original. In practice, however, it is found that by the use of only the three primary colours, the finished print lacks depth, and to get a better reproduction a printing from a black block is added.

A four colour half-tone print is in fact an optical illusion, as will be seen if a colour print is examined through a magnifying glass. It will be seen that the apparently solid colours are composed of a number of dots, and the actual colour apparent to the eye is caused by the proportion and size of the coloured dots. It will also be observed that the coloured dots do not all print on top of each other, but are so close that the eye mixes the colours to produce different shades.

To make a set of four colour half-tone blocks it is necessary to photograph the original through coloured filters, each filter allowing only the light reflected by one of the colours to reach the photographic plate.

In photographing, the screen is placed at a different angle for each colour to prevent the half-tone images producing a distracting pattern known as "moire." While the angles are not fixed, they are not usually less than 30°.

The etching is similar to standard half-tones except each plate must be etched to produce the amount of colour required. This is called colour correction and is necessary because of the difference between photographic colour and ink colour.

In proofing, a set of "progressive" proofs are taken for each colour in correct rotation for printing as well as all colours together.

Letterpress Printing Machines

As its name implies, letterpress printing is achieved by pressing letters and blocks on to paper to form an image.

There are three methods in general use for obtaining printed impressions—platen, cylinder and rotary machines.

The Platen: This is the simplest machine, in which the type is fixed in a vertical position. The inked rollers pass over the type and then the platen on to which the paper has been placed hinges from a near horizontal position to the vertical and presses the paper against the type with sufficient pressure to secure a good print. The platen then hinges back to the near horizontal, when the printed sheet is removed and another sheet inserted. Although for short runs and for certain special work platens are hand fed, the majority are now automatically fed at speeds three or four times as fast as can be achieved by hand feeding. Platen machines are not normally used for printing sheets larger than 10 in. × 15 in.

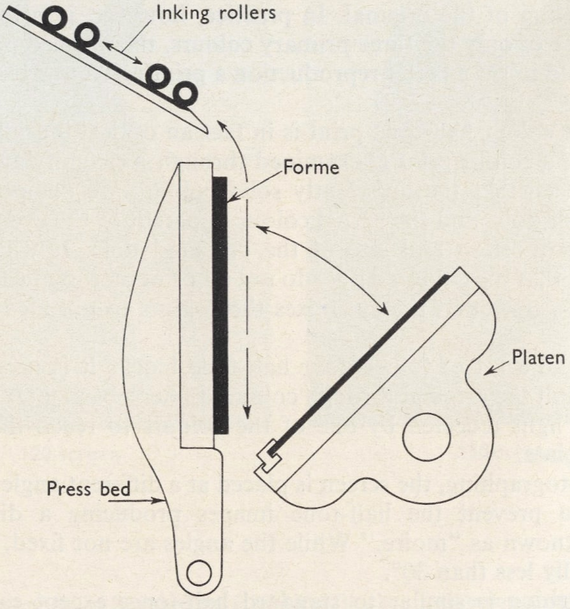
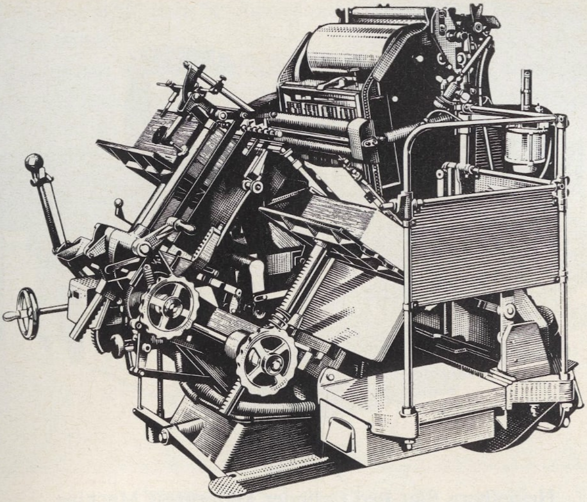


Diagram of a Platen Printing Machine.



Thompson Automatic Platen.

Flat bed cylinder machines: These are used for the larger sheets of paper, for bookwork and for the production of journals where the quantity printed does not justify the use of rotary machines.

The type and blocks are fixed on to the horizontal "bed" of the machine, which has a reciprocating motion and passes below the printing cylinder and the inking rollers. As the bed passes to and fro the type is inked and the cylinder revolves, carrying with it the sheet of paper to be printed pressing it on to the inked type to receive its impression. As the revolution is completed, the printed sheet is removed from the cylinder and stacked at one end of the machine.

There are numerous types of cylinder machines and variations, but the two most distinct versions are firstly the stop cylinder and, secondly the two revolution machines. In the former, the impression cylinder is stopped after the printing to allow the bed to return to the

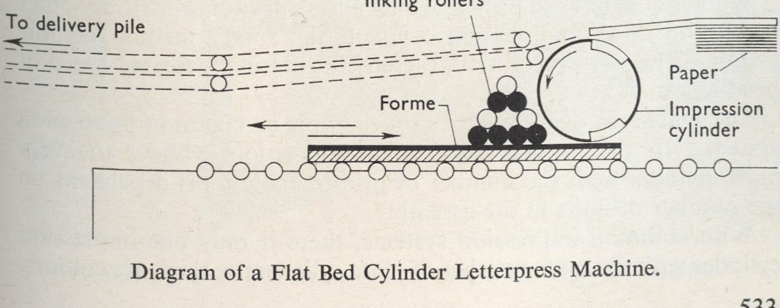
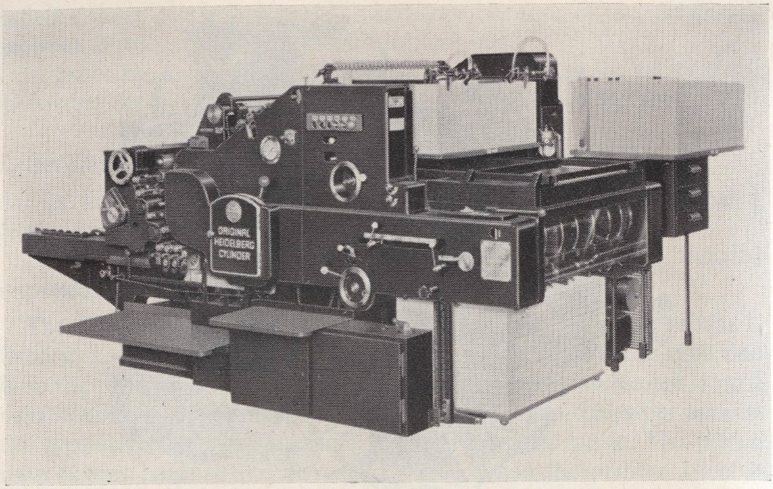


Diagram of a Flat Bed Cylinder Letterpress Machine.



Heidelberg Flat Bed Cylinder Letterpress Machine.

inking end of the machine, whereas, in the latter, the cylinder revolves continuously and makes two complete revolutions for each printing impression.

Perfecting machines have duplicate inking systems, beds, impression cylinders and a means of transferring the sheet to allow printing on both sides.

Two-colour machines are similar to the perfectors, but the colours are printed on one side of the sheet at one impression.

Sheet fed rotary letterpress machines: The development of the flexible thermoplastic and etched "wrap round" plates has brought rotary letterpress printing into more general use. The plastic plates are attached to a plastic or thin metal sheet by double sided adhesive tape, and then wrapped round the plate or cylinder of the machine. Etched wrap round plates, which may be of copper or other material sold under proprietary brand names, are made in the full size for the machine. Thus, they have the advantage that there is only one plate to position instead of several as in conventional letterpress.

Whereas the flat bed principle only allows printing with every other revolution of the impression cylinder, the rotary method permits printing with each revolution, thereby facilitating increased speed of production.

The machines operate either on the unit or common impression system. In the former there is an impression cylinder to every plate clyinder and, the number of printing colours is dependent on the number of units in the assembly.

With common impression systems, there is only one impression cylinder with the same number of plate cylinders as there are colours.

A perfecting unit can be incorporated to allow printing on both sides of the sheet.

The presses are used for publications, commercial work, packaging materials, etc., where accurate print registration is required for high-quality work at speed.

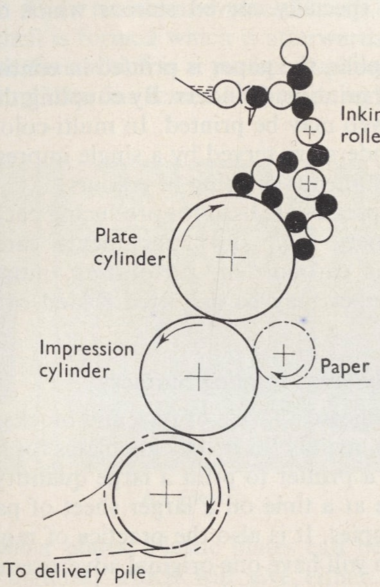
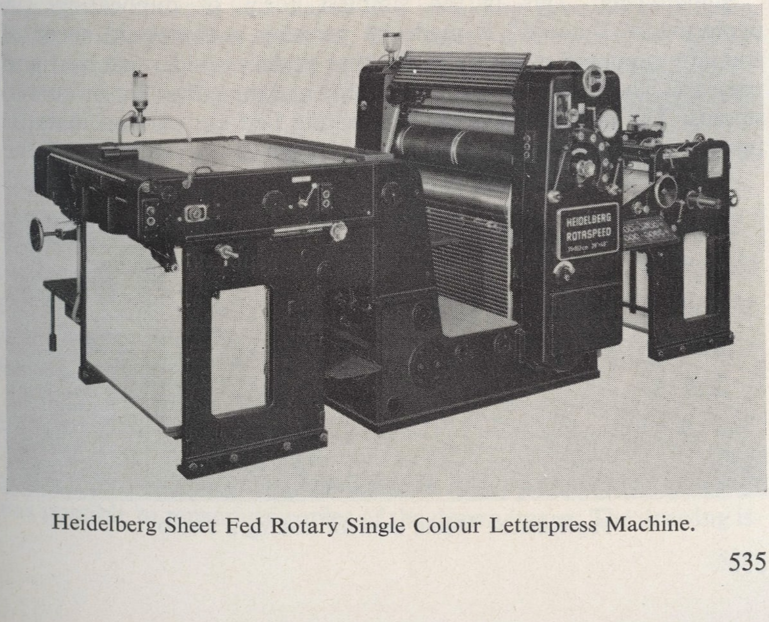

Inking
rollers
Plate
cylinder
Impression
cylinder
Paper
To delivery pile

Diagram of a Sheet Fed Rotary Single Colour Letterpress Machine.


HEIDELBERG
ROTASPEED

Heidelberg Sheet Fed Rotary Single Colour Letterpress Machine.

Web fed rotary letterpress machines: These have one or more pairs of cylinders, one of which is the impression cylinder and the other takes the printing plate which has been prepared from the flat type.

The main use for rotary presses has been for newspapers, where very high speed production is required. The plates for these machines take the form of specially curved stereos which clamp on to the cylinder.

As the name implies, the paper is printed in continuous form as it passes through the printing cylinders. By coupling the printing units, both sides of the web may be printed. In multi-colour printing, two or more plate cylinders are served by a single impression cylinder to allow almost simultaneous printing of colours.

Special purpose presses are used for producing packaging materials continuous stationery etc., and attachments cater for finishing operations such as carbonizing, perforating, numbering, folding, cutting etc. The paper may be delivered folded or in sheet or roll form.

Duplication of Letterpress Printing Surfaces

It is possible to duplicate a forme of type and blocks and this is done for various reasons, mainly for producing plates for rotary machines, but also to enable a printer to print a large quantity of a small size job more than one at a time on a larger sheet of paper, afterwards cutting to single copies. It is also the practice of most advertisers to employ agents who will have one original advertisement set and then arrange for duplicates to be sent to the various papers in which the advertisement is to appear, thus ensuring complete uniformity.

Stereotyping: This is the simplest form of duplication. A papiermâché "mould" is made by pressing a dampened sheet of specially prepared paper on to the type under considerable heat and pressure. These moulds can be used for making either flat or curved stereos. The mould is placed in a casting box and molten metal is poured into the mould, thus producing an exact duplicate of the

Security clampdown as Johnson visits Dallas

New Viet Cong rocket attack on U.S. air base

FORTY Russian-built rockets smashed into the sprawling American air base at Bien Hoa, 20 miles north of Saigon, in a co-ordinated Viet Cong rocket and mortar assault today.

TWO DIE IN

Confused

Delegation

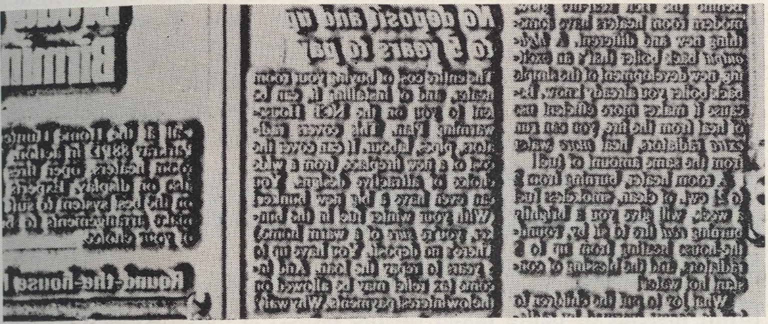
deadline hustle goes on

by STANLEY SPARKS

Papiermache Mould used for making a Stereo.

type and blocks. Stereotypes are suitable only for the reproduction of type and coarse screen half-tones and where a certain amount of shrinkage is permissible.

Electrotyping: This process is used where greater accuracy is required. The type is moulded in a thermoplastic material which is then treated with silver nitrate and placed in an electro depositing bath. A copper shell is formed which is afterwards prepared to produce a printing surface which is a perfect duplicate of the original. It is possible to duplicate fine screen half-tones and colour half-tones by this process.



An Electro.

Plastic and Rubber plates: Plastic plates can be made in various types of plastic material which will give either hard non-flexible plates or softer flexible plates for rotary printing. There are several methods of making such plates but generally the forme is covered with plastic material and placed in a moulding press to produce a matrix under pressure and heat. The "mat" is then covered with a thermosetting plastic powder and another sheet of plastic. Again heat and pressure is applied, after which the plastic printing plate is stripped from the matrix.

Rubber plates are similarly made except that uncured rubber is placed over the matrix and vulcanised to make the printing plate.

2. Lithographic Printing

Lithography

The first principle upon which lithographic printing is based is that grease and water are naturally repellent—*i.e.*, grease does not mix with nor is wetted by water.

The discovery of lithographic printing is credited to Alois Senefelder who, in the latter half of the eighteenth century, discovered that a special form of limestone quarried in Bavaria could be treated to receive a drawn image and that by further treatment it was possible to reproduce copies of the drawn image. The drawing is made with a greasy ink or crayon on to a polished piece of stone, the whole being then "etched" with a weak solution of acid and wiped over with a solution of gum arabic. If the whole surface is moistened with water and then inked, the image areas accept the ink while the non-image areas remain moist and reject it.

Printing from stone was carried out on flat bed machines which were somewhat similar to flat bed letterpress machines, except that damping rollers were added to enable the alternate damping and inking of the stone to take place before the paper was pressed on to the stone to receive the printed image.

Stones were heavy and cumbersome to handle and the machines upon which they were used were necessarily slow. Towards the end of the nineteenth century it was found that zinc—if given a suitably grained surface—reacted in the same way as stone.

It was not long before it was realized that thin zinc plates could be wrapped round a cylinder, thus permitting machines to be developed which could run at much higher speeds.

Printing direct from zinc plates continued well into the present century until the offset principle became generally accepted as a superior method.

The litho-offset process is the same as lithography, except that a print, instead of being taken on the paper, is made from the plate first on to a rubber blanket stretched round a cylinder, and from the blanket it is transferred or "offset" to the paper.

Whereas direct lithography requires the image to be in reverse so that it is printed the right way round, in offset it commences as a right reading image. On transfer to the blanket cylinder it is reversed and, when printed to paper, becomes right reading again.

The greasy printing image can be prepared by the artist making the drawing himself; this is known as autolithography. Alternatively, litho-draughtsmen copy the image to be reproduced on to the printing plate. Special litho inks and crayons are employed and shading and other variations can be effected by the use of shading media.

In chromo-lithography, the work is produced in colour by the artist or draughtsman. Since a separate plate is required for each colour, the design must be divided up into its component colours. These are then "keyed" by various techniques to produce a non-printing image for each colour plate.

It is also possible to transfer an image to the plate, from special paper transfers which have been hand written or drawn, or taken from type, engraved plates, original litho stones, etc.

While these methods are still used, the majority of commercial work today is accomplished by photo-lithography or photo-offset printing, the printing plates being made photographically instead of being drawn.

Preparation of Copy

Original material for lithography is called "copy"—not to be confused with the same term used by the letterpress printer referring to an author's manuscript. It can include photographs, drawings, hand lettering, other artwork and type reproduction proofs. The preparation of artwork and copy requires specialized skill, knowledge and accuracy and should only be undertaken by those competent to do so.

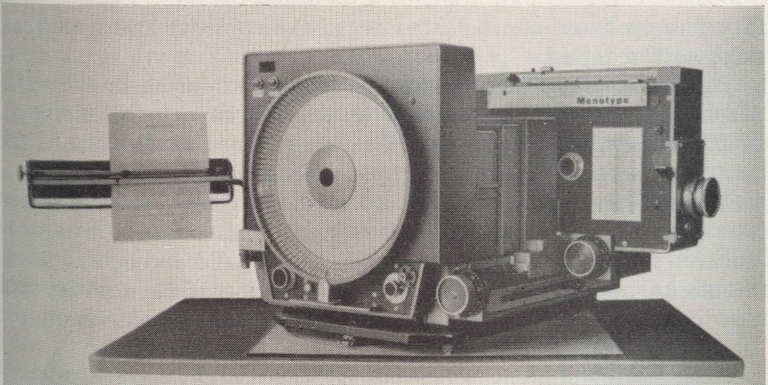
Line Copy: This consists of type matter, lines and solids with no tonal variation, such as pen and ink drawings, typewritten material, etc.

The text can be machine set from "hot type" machines, such as the Linotype and Monotype. A reproduction pull is then taken and treated as copy for photographing. This is a useful method when the type is already "standing," *i.e.*, having been set for another job and not "dissed."

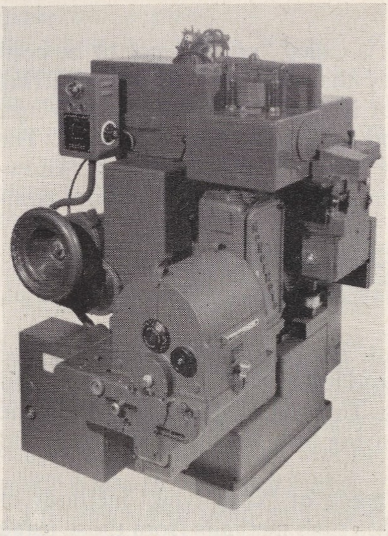
However, considerable use is made of "cold type" methods of composition. The term distinguishes such methods from those using "hot type."

Various special typewriters are available for producing copy suitable for photographing. They range from machines with fixed type faces and which require a second typing of the text to achieve line justification, to others with a variety of type faces, size of type, and with semi or fully automatic means of justifying.

Typewriter composing does not allow for the larger display types. For this purpose photo-lettering machines are employed. These set the letters photographically one at a time, and automatically compose them into words and lines on film or paper.



Monotype Photo-lettering Machine used to Set Display Matter from 6 to 96 Point. Each character is individually dialled by the operator. Up to 300 characters may be accommodated at one time.



Monophoto Filmsetter used to Set Text Matter in Sizes Ranging from 6 to 24 point.

Photo-composition is now used for a variety of work, including books and magazines, and its use is steadily increasing. Several systems are available using different principles to control the selection of characters, enlarge or reduce, to space, justify and expose. Most of the photographic units are controlled by punched or magnetic tape which has been produced on a keyboard unit, or by a computer. Tape merging units are also available for some systems. These enable corrections to be keyed on a separate tape to produce a correction-free master tape. Machines vary considerably in speed from several thousand characters an hour, to a thousand characters per second. The film produced can be either negative or positive and paper can be used if required.

Half-tone Copy: There is no difficulty in producing line illustrations, but photographs, as with letterpress, have to be screened. The negatives are made to a full range of tones as opposed to the restricted range required for normal letterpress blocks.

Highlight gradation with the older type of glass cross-line screen was poor, but considerable improvement is obtained with modern contact screens. Photographic masking or hand retouching techniques are also used to improve tone rendering at the negative and positive stage, as it is not possible to carry out corrections on the printing plate itself.

After photographing, the line and half-tone negatives are "stripped" together, ready for printing down on to the plate. For colour printing, a plate is required for each colour. Multicoloured half-tones require the production of screened, colour separation negatives.

Proofing

It is a relatively simple matter in letterpress work to obtain proofs at any stage during production and corrections can, if necessary, be carried out right up to the machining stage. With litho it becomes more difficult as the work progresses and, if corrections are to be made, these should be done before the film is assembled or plates are made.

With colour work it is usual to proof complete on a proofing press or a production machine. For type and line illustrations proofs can be obtained by a variety of methods, such as conventional photography, or the dyeline reprographic process.

Because of the loss of quality during reproduction, some authors and print buyers are reluctant to accept these kinds of proofs and it may therefore be necessary to put down plates for proofing purposes. Any corrections to be made will require a new plate which may mean going back to the repro stage for complete setting, or single words and lines will have to be stripped into the assembled film. This stripping in may be difficult where the work is intricate and the cut edges of the film are likely to cause problems during plate making.

The stripping in of odd lines or words is further complicated by the difficulty in matching the weight of type face of the correction to that already on the film. This is because the amount of ink can vary at the repro stage and development of the subsequent film may also give a different result.

Preparation of Plates

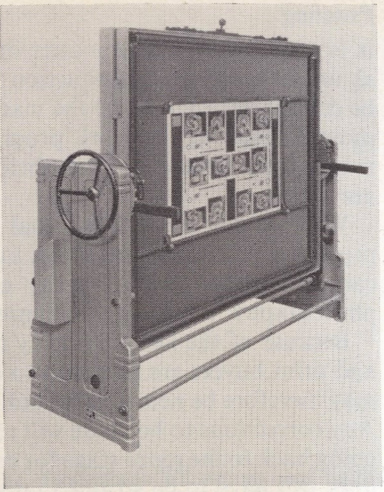
As the name implies, photo-lithography is a process whereby the printing image is produced photographically. The plates for offset are generally made of zinc or aluminium, although for very long runs other metals are used.

The plate is first grained to assist the retention of water in the non-image areas. After this it is coated in a "whirler" with a light-sensitive emulsion which in some instances becomes the actual medium that transfers the ink to the blanket cylinder.

The coated plate is then placed in a vacuum printing-down frame and exposed to light through the negative or positive of the image to be printed. The emulsion is hardened in the areas exposed to the light and becomes insoluble in the developer, which in some processes is ordinary water. The image areas are coated with a greasy ink and the non-image areas desensitized with etch and gum solutions. For long runs, plates are usually of the "deep etch" type where the printing image is etched slightly below the surface.

For very long runs, bi-metal plates can be used. The top layer of metal, usually chromium, is water receptive, while the lower layer of copper, which is exposed during the etching process, is water repellent and ink attracting. When on the printing machine, the plate

Whirler for Coating all Types of Deep-etch Litho Plates of up to 39 in. × 30 in. in Size.



Vacuum Printing-down Frame in the Loading Position.

is alternately moistened and inked, the etched image fills with ink, and this image is transferred to the rubber blanket and thence on to the paper.

Plates may now be obtained which have been pre-sensitized by the supplier. Their use eliminates the coating process, and the subsequent development is not so complicated. They are usually aluminium but are also obtainable with a plastic or paper base. The suitability of such plates is for short and medium runs.

Duplication of Printing Image

When a number of copies of the same image are to be printed, such as labels, the image may be reproduced in multiple from a single negative with a "step-and-repeat" photo-composing machine. This copies the negative many times on to a large photographic plate, producing multiple positive images.

This is then printed down on to a "deep-etch" litho plate, suitable for long runs.

Other types of step and repeat machines are designed to print the negative on to the sensitized plate itself.

Offset Lithography

Offset machines are now used for practically all forms of litho printing; they are all of a rotary type and are provided with three cylinders. The printing plate is attached to one cylinder, which is so placed that as it revolves it is alternately damped and inked. The ink image is transferred to the second cylinder, which is covered with a rubber blanket, and this image is finally transferred to the paper held by grippers and carried round the third (impression) cylinder.

These machines are mainly sheet fed, either single or multi-colour, ranging in size from small office-type machines to large perfectors. The use of two or more printing units, each with its own set of cylinders, inking and damping units, enables more than one colour to be printed at one pass through the machine. This "wet-on-wet" principle requires careful machine setting and specially formulated inks, but it increases the output very considerably. Four colour machines are becoming increasingly popular, mainly for long run good quality colour advertising literature.

Smaller offset machines are now widely used as an office method of producing forms, literature, etc. For this purpose, the process and various techniques employed are dealt with in greater detail in the chapter covering office reproduction processes.

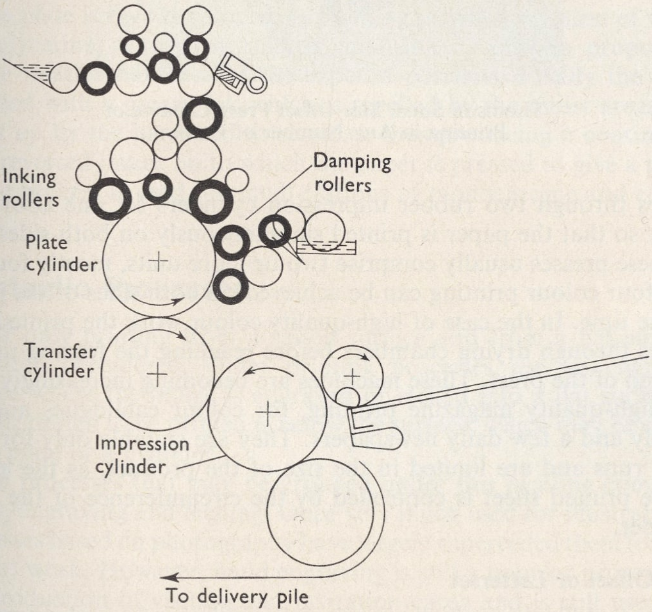
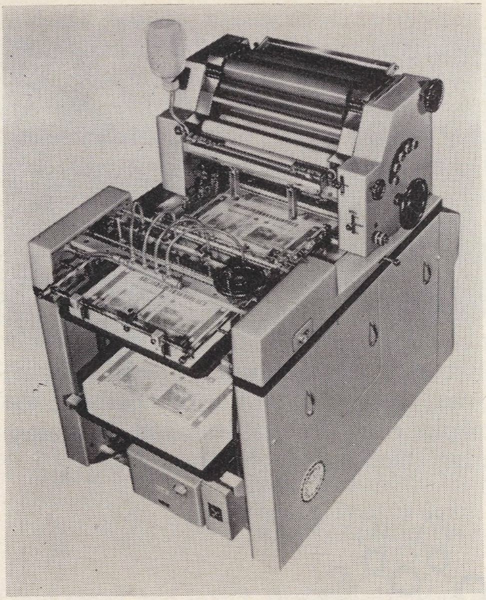


Diagram of an Offset-Litho Machine.

Web Offset

Rapid developments in litho plate making and in machine design have made it possible to print litho offset from reels of paper as in letterpress newspaper presses. There are a number of types of web offset presses, but the most common is the machine where the web



Thomson Small Size Offset Press Capable of Printing in Any Number of Colours.

passes through two rubber impression cylinders set one above the other so that the paper is printed simultaneously on both sides.

These presses usually comprise two or more units, mostly four. so that four colour printing can be achieved on both sides of the paper at one time. In the case of high-quality colour work the printed web passes through drying chambers before reaching the folding unit at the end of the press. These machines are becoming increasingly used for high-quality magazine printing, for colour catalogues and for weekly and a few daily newspapers. They are suitable only for very large runs and are limited in the size of the product, as the length of the printed sheet is controlled by the circumference of the plate cylinder.

Dry Offset or Letterset

Owing to difficulties which can arise when printing from planographic offset plates, caused by the fine adjustments required to obtain a correct balance between the damping water and ink, research has taken place to find suitable plates for printing on offset machines which can eliminate the use of damping rollers.

Suitable plates are now available which are etched on either thin metal or photo polymer material. These plates are etched in a similar way to line blocks or half-tones, but with a much shallower depth.

These plates can be used on suitably modified offset litho machines and will print without the use of water. The resultant print is comparable with offset litho, and generally the output of the machines is higher.

Collotype

As this is a method of planographic printing, a reference to it may be included at this point.

This process is very little used as it requires great skill and has to be operated under very carefully controlled atmospheric conditions. Therefore it is relatively expensive. It is the only printing process where the image is not broken up by the use of a mechanical screen.

The printing plate consists of a sheet of stout glass or metal and is coated with a light sensitive solution of gelatine which is dried hard to form a thin film. The plate is exposed to light through a reversed negative, and the gelatine coating is hardened in proportion to the light passing through it.

The plate is then developed by flooding it with a solution of water and glycerine, which the gelatine emulsion absorbs in proportion to the relative hardness of the exposed portions. Finally the plate is rolled with a greasy ink which is repelled by the moist areas and taken up by the hardened drier areas, thus producing a continuous tone reversed image on to which the paper is pressed to give a print.

The process is used for small editions of monochrome and colour work.

3. Intaglio Processes

So far only printing from a raised surface and from a flat surface has been considered. Other printing processes use an engraved surface where the image is engraved or etched into a flat surface—*i.e.*, the design to be printed is below the surface, which may be either a flat plate or a cylinder.

The processes that may be grouped under this heading comprise firstly, engraving and etching. Once very much used for illustrations, processes based on photography have largely superceded them for this type of work. However, hand engraving is still a popular process for the production of visiting and invitation cards and is still used for letterheadings, maps and some security work such as share certificates, etc.

Secondly, there is photogravure which is a photographic process. A large number of the popular magazines, postage stamps and other types of security printing are produced by this process.

Very many special techniques are employed in these processes, all of which are highly skilled crafts. As with other sections of this chapter, the information is of necessity only a brief outline.

Engraving

The engraving of, and printing from a copper plate, is probably the simplest and best known example of the intaglio processes. Firstly the design is made on paper, and then transferred in reverse by

Precision Pantograph Engraver. Master Plates can be seen hanging on the wall.

various methods to the plate. It is then engraved with tools known as "burins." Although line engraving can be of various widths and depths, there are limitations as the method of printing from the plate is not suitable for large solid areas of ink.

On completion of the engraving, prints are taken from it in a press, not unlike a mangle. It consists of two steel rollers and a sliding bed plate of iron. The plate is warmed sufficiently to soften the stick of special copper plate ink which is worked into the engraving with a "dabber." Surplus ink is then wiped off from the plate. The material to be printed is placed on top of the plate, both of which are then passed through the rollers of the press under heavy pressure; this forces the material into the design to pick up the ink in the engraving. The resulting print is a raised surface of the design, characteristic of the process.

Stipple, Dry-point, and Mezzotint engraving are various techniques to give additional effects, but rarely used today.

While hand engraving is necessary for free style lettering, special designs, etc., mechanical engraving is now employed for standard lettering forms. A precision pantograph is used to reduce large size characters on a master plate to the size required.

Another method, but not so generally used, is to punch the character into the metal with a small letter punch. This is particularly useful for hand-press dies where a counterpart is required.

Steel can also be used, and since it is a much harder metal than copper, more finely engraved work can be achieved. However, engraving has to be made while the steel is in a "softened" state, after which it is case hardened. Copper plates can be given a "steel-face"—or chromium, and this is desirable when the length of run may wear down the copper.

Transfers in a greasy ink can be taken from engravings for subsequent reproduction by lithography.

Etching

Copper plates may also be etched which enables a more freely and lightly drawn line than with engraving.

The plate is warmed and coated with an acid-resisting etching "ground," usually made with bitumen and wax. The reverse side is coated with shellac as a protection to the acid. Then the design is drawn through the ground with an etching needle, or diamond point, which exposes the metal.

Nitric acid is used to etch the design to the required depth, and an acid resisting varnish applied. Areas requiring further etching are again treated with acid and the process repeated until all parts of the design are etched to sufficient depth. Other techniques are also employed to obtain variations in depth and width.

Finally, the remaining ground is removed and prints taken in a similar manner as for engraving. If many copies are required, then the plate may be steel-faced.

Aquatint etching is a method of producing flat tones of varying depths without detail, often used in association with line etching.

Photogravure

Now often known as "rotogravure," the commercial application of this process makes it the most important of the intaglio methods. Widely used for publications, packaging materials, works of art, etc., which involve very long printing runs, it is a highly specialized process, involving many techniques.

Original copy is photographed, and line and continuous tone negatives produced. After retouching, positives are made and further retouched if necessary. Proofs are then taken at this stage, on dizao or other photographic type papers. This is essential as once the image has been transferred and etched on to the cylinder it is not possible to make corrections.

The image is transferred to the cylinder by the use of "carbon tissues"—a sensitized pigmented gelatine transfer medium. In conventional gravure, this is first screened by exposure to gravure screen of crossed lines. Unlike the halftone screen, the lines are of equal size squares, and have nothing to do with the production of tones. It forms an acid resist of crossed lines which eventually form the walls between the cells to be etched, which will hold the ink.

A second exposure is made through the film positives. The gelatine reacts according to the strength of light passing through. It becomes hard and insoluble where the screen lines occur, *i.e.*, where little

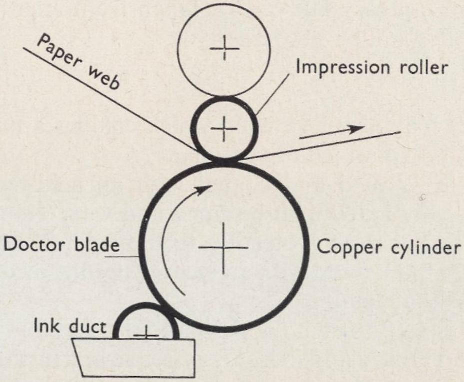
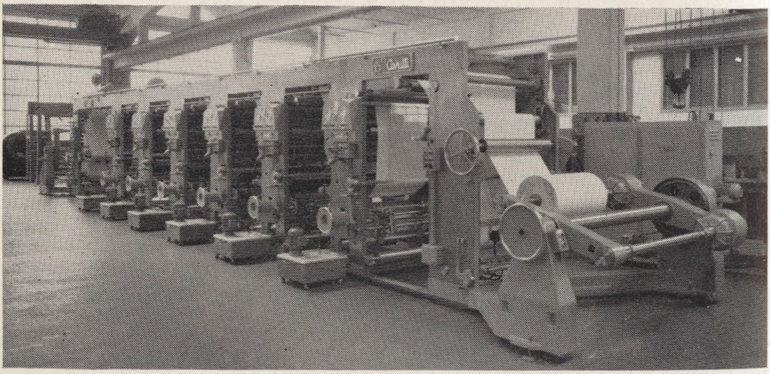
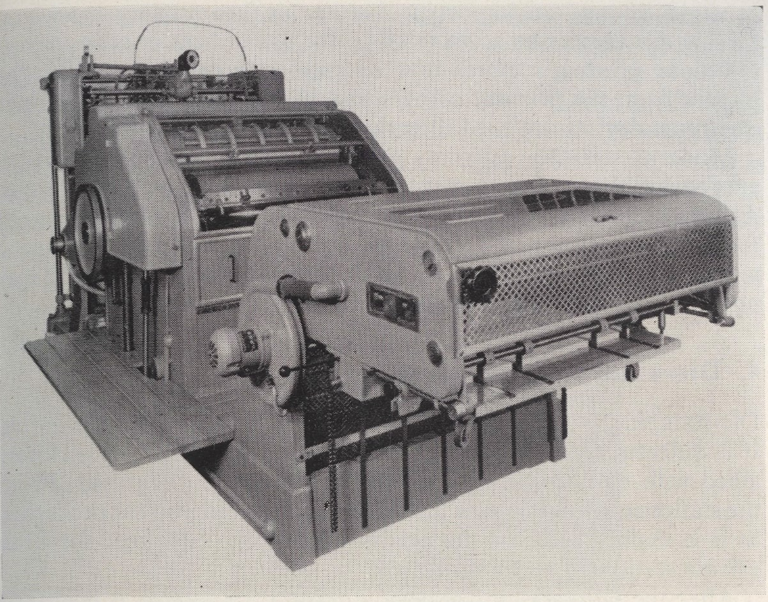


Diagram of One Printing Unit of a Photogravure Machine.



Cerruti High Speed Photogravure Rotary Press for Full Colour Printing of Packaging Materials.



Prima Sheet Fed Gravure Press.

light has penetrated, and varies in hardness in other areas according to the tone of the image.

The gelatine is then positioned on to the cylinder, exposed side down, and developed with hot water which washes away the soluble parts, leaving a gelatine resist which again varies in thickness according to the tone values of the image. By various techniques the image is then etched. Acid penetrates firstly through the shadow area—the thinnest gelatine areas, next the middle tones, and lastly the highlights. The screened cross lines are not affected. As the depth of etching results from the amount of light passing through the carbon tissue on exposure, the tone values on printing are rendered by the amount of ink in each cell transferred to the paper.

Another form of gravure is intaglio halftone. Varous methods are employed, using screen positives made by a modified halftone technique, to produce cells in the form of dots varying in depth and size. Inverted halftone cylinders of this type are principally used for colour work as more control is possible in etching.

In printing, the cylinder revolves in an ink trough to fill the etched cells. Excess ink on the remainder of the cylinder is removed by a doctor blade. Ink in the printing cells is transferred to the paper as the latter passes between an impression cylinder and the plate cylinder. The ink consists of a pigment or dye dispersed in a solution of resin in a volatile solvent which evaporates on printing and assists in rapid drying—an important feature on fast running machines. Drying can further be accelerated by the use of heat or air currents.

Colour printing requires four separate cylinders to build up the picture from the primary colours and black. On web fed machines electronic devices are used to ensure register and colour control.

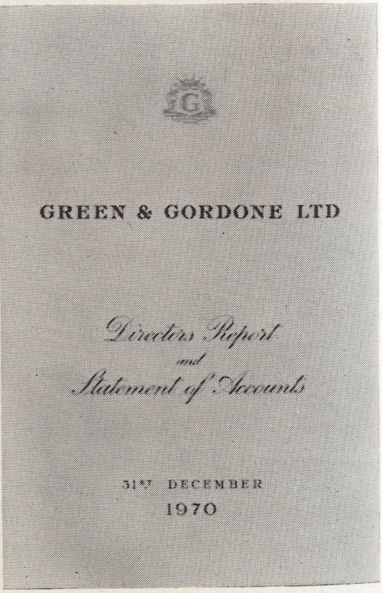
Modern web-fed gravure presses operate at speeds which approaches those of the newspaper rotaries, giving very high output. As presses and cylinders are very costly, very long runs are required for economic production. Sheet-fed gravure often used for printing works of fine art, also operates on the rotary principle and produces one printing with each revolution of the cylinder.

4. Die-stamping

Die-stamping is a special form of intaglio engraving and printing. It is different from the other processes and is, in fact, more closely allied with embossing, with which it is sometimes confused. From the stationer's point of view it is one of the most important processes, as it is mainly used for the production of letterheadings, for both private stationery and business use.

After the final sketch has been approved, the design is engraved into a piece of steel approximately half an inch in thickness. The

Hand Engraver Working on the Insignia for Annual Report Cover.



GREEN & GORDONE LTD

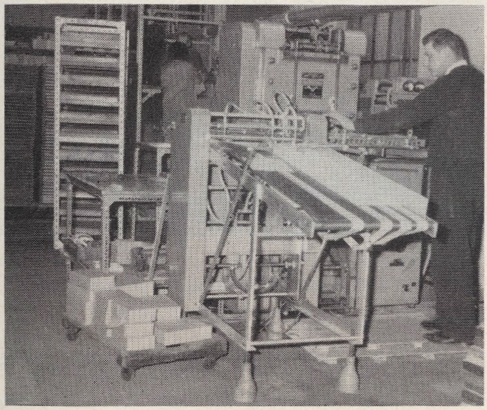
Directors Report
and
Statement of Accounts

31ST DECEMBER
1970

A Die-stamped Annual Report Cover.

engraving is carried out by hand, by machine or by chemical etching. After proofs have been approved, the die is case hardened so that the surface will not scratch or mark.

Die-stamping presses are of two types—the standard press where the die is placed face upwards or the inverted press where the die is carried face downwards in a moving carriage. In each case the die is inked with a roller having a cloth covering so that all the engraved part of the die is filled with ink. Inverted presses are now generally used. The die then passes over a flexible steel blade, which removes the surplus ink from the face of the die, and then over a wiping pad over which a roll of paper passes so that the face of the die is wiped clean.



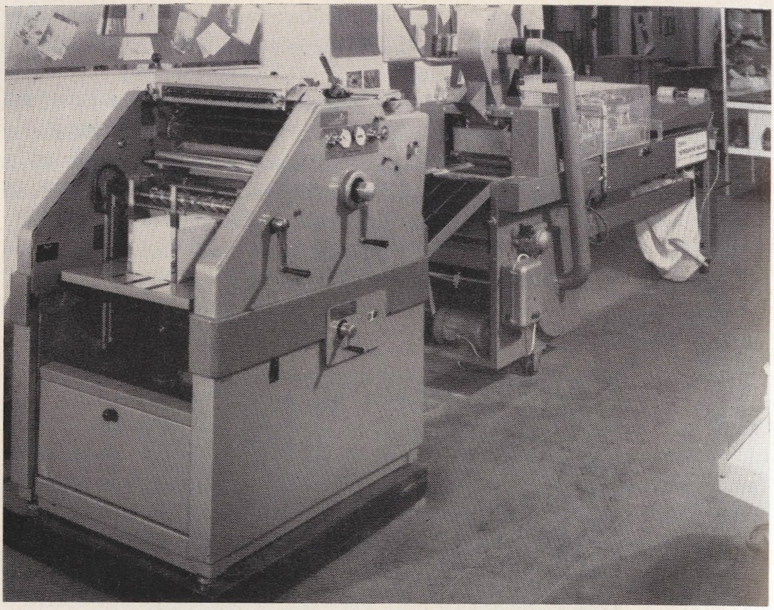
Waite & Saville Die-stamping Press used for Letterheadings and Other Business Stationery.

The paper to be stamped is fed into the machine between the die and a force which has been made by taking a heavy impression of the die on to special card to give a slightly raised impression of the die.

As the die and the force are brought together, with the sheet of paper between, the force pushes the paper into the die to assist in transferring the ink from the engraving to the paper and to give the raised effect.

5. Thermographic Printing

The raised effect produced by die-stamping in black or in colour can be imitated by dusting a freshly printed sheet with a fusible resin and heating so that the resin fuses and adheres to the ink. The fused resin and ink give a raised impression which bears some resemblance to die-stamped work, but it is not so sharp and there is no sunk-in effect at the back of the sheet. Any colours, including silver and gold, can be used. The advantage of this process is that the



Zephyr fully automatic thermographic unit linked to a Rotaprint offset machine.

prints can be made from type or line blocks, thus avoiding the heavy cost of engraved steel dies.

Today, thermography is widely used with offset printing, and a thermographic unit can be attached to the offset printing machine to produce the work in a continuous operation.

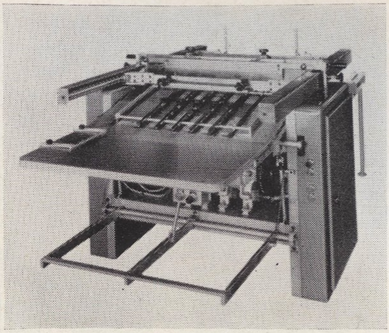
6. Screen Printing

Although it is in no way a major printing process, mention must be made of silkscreen printing.

This process is basically a form of mechanized stencilling. A fine screen of silk or fine wire mesh is stretched tightly in a rigid frame and a stencil of the design to be reproduced is stuck to the screen, the non-printing areas being blocked out. The stencils can be hand cut or produced by photographic means. The screen is placed over the sheet of paper to be printed, ink is flooded on to the screen and squeezed through the open mesh by means of a rubber squeegee; the screen is then raised and the print removed to dry.

A particular feature of screen printing is the relatively thick film of ink it produces. Although the film can be controlled by the mesh of the screen, the ink itself or additives to it, each printed sheet must be laid out separately on racks, to dry for several hours. Drying time

Aeropress Semi-automatic Sheet Fed Screen Printing Press.



Progress Cylinder Screen Printing Press.

can be shortened however by the use of infra-red rays, or other methods.

The printing is matt and opaque which allows light colours to be printed on dark backgrounds. Colourful results can be obtained by multiple printing, and the process is eminently suitable for reproducing large size type matter, flat tones and line work. However, for half-tone screen work a coarse screen is necessary as fine screens do not reproduce satisfactorily.

A variety of inks are available including colour bases of enamels, acrylics, vinyls, nitro-cellulose lacquers, ethyl cellulose and rubber based materials.

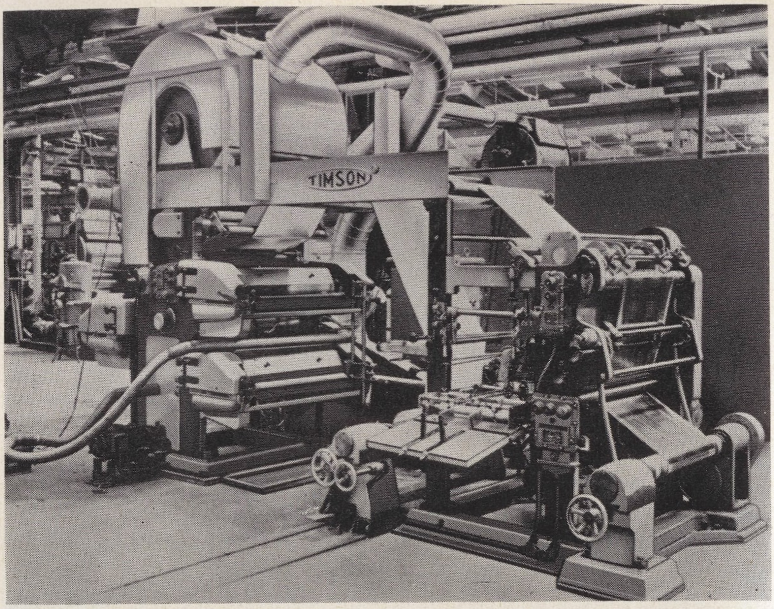
The above factors, together with the variety of presses available, enable the process to be used for printing on flat or curved surfaces of a wide range of materials, including fabrics, glass, metal, etc. It is very much used for posters, display cards and the like.

7. Flexographic Printing

Previously known as Aniline Printing, this process employs relief moulded rubber, or resilient plastic plates, to print in quick drying inks on high speed web rotary presses. It is widely used for printing wrappings, cartons, paper bags, etc.

The plates can be hand cut but, more often they are rubber stereos, taken from type or photo-engraved plates in line or coarse screen halftone. A matrix is made first, using "flong" or a resin composition sheet under heat and pressure. Unvulcanized rubber is then placed on the matrix and heated under pressure to vulcanize.

Aniline dye inks are very fluid and quick drying due to the spirit content. This feature, together with the resilience of the rubber plate, permits the high printing speeds. However, although bright in colour, these inks are transparent. They are suitable for rough absorbent papers and hard surfaces, such as glassine, cellulose film, polyethylene, etc.



Timson Three Colour Flexographic Press which can work reel to reel or reel to sheet.

Pigmented spirit inks are now in use which are opaque and therefore produce a more solid and richer printing. Inks, with other solvents, are also used to give gloss and water-resistant properties.

The types of flexographic press are many and varied. They print from one to six colours and often form part of a complete converting process unit. The rubber plates are easily mounted on the printing cylinder and can be changed quickly.

8. Graphic Design

As well as a broad understanding of printing processes and materials to enable the stationer to meet customers' special requirements, it is becoming increasingly important for him to have some knowledge of, and taste for, good design in relation to his merchandise. There is more general appreciation now for articles of simple construction, well made from appropriate materials, using interesting colour schemes, and retailing at economic prices. In many spheres, stationers have contributed their quota to the up-grading of the appearance of office equipment and materials, but much remains to be done with regard to printed items, such as business stationery, advertising literature and catalogues, social stationery, etc.

This section deals primarily then with design for print, of which typography, dealt with in the following sections, is an integral part.

Such information can be a great aid to sales promotion, both with regard to the actual appearance of the stationery stock, and to the stationer's ability to give practical help to the customer who has no idea how to go about getting a particular job designed and printed. Here it is fair to point out that the old adage "A little knowledge is a dangerous thing" can, without doubt, be applied to print design.

There are print designers, just as there are printers (some printers have a design unit within their works). Both are professionals who have an intimate understanding of the materials with which they work, and are mutually dependent upon the craftsmanship of each other, to produce a satisfactory final result. However, a working knowledge of each of these activities is of undoubted benefit to anyone acting in the advisory capacity mentioned above, since without it there can be no understanding of the economics involved and the customer will receive very poor service.

The first fundamental principle of good design, whether for print or any other purpose, is that it should be related to the function of the article and the environment in which it will be used. The materials, method of constructions (in the case of print design, layout), means of reproduction and use of colour, must always be thought of in conjunction with each other, and used to interpret the client's instructions—unless the design is a prototype with no specific instructions given.

To give an example, a letterheading for a firm of heavy machine tool manufacturers should express in the choice of type face, colour, layout and paper, the activities of the firm for which it is designed. A letterheading for a ladies' hairdresser should show quite different qualities, a daintiness and femininity which would be most inappropriate to the first example.

Secondly, simplicity is also the keynote to good design, especially in business printing. A dictionary definition of design is given as "purpose or intent" and a solution to a problem reached by the most direct route, taking all relevant factors into consideration, is bound to be more telling than the devious and "clever." It will certainly be more economical.

A good designer should know that the greater the number of colours used in printing, the higher the cost of the job will be, especially if the quantity required is small. Again, this has to be related to the purpose for which the item is intended and its value to the customer. For example, a seed catalogue would almost certainly need four-colour half-tones for letterpress printing or four-colour litho, since the selling value of the catalogue lies in its ability to show the potential buyer of seeds how beautiful the results of his labours will be. But it would be sheer extravagance to design a four-colour letterheading or menu card, unless for a very special occasion.

An outline of the various processes of reproduction of printed matter has already been given. To advise on the design of a job, the stationer needs to know what quantity the customer requires, so that he can decide, with reference to a printer for confirmation, which process will prove most useful in terms of cost and quality. Broadly speaking, for short runs of 500–1,000 copies, silk-screen or small offset litho are best. Silk-screen tends to give a coarser printed result than litho, although some very fine letterheadings have been produced by silk-screen and some half-tones can also be printed. Small offset litho gives a clean-cut if somewhat grey appearance, lacking the depth of solids which can be obtained by letterpress. Half-tone work in small offset appears "dead" by comparison with letterpress printing from blocks, but this process is rarely economic for runs of less than 1,000 and even this would be considered a short letterpress run. Lithography on larger machines, some of them printing two, three and four colours simultaneously, require at least a print order of 5,000–10,000 copies. All this is based on the time it takes to set up the work on a machine and "make it ready" and to clean up the machine afterwards. It will readily be seen that to print a few hundred copies of a letterhead or other small job in several colours can be uneconomic unless it pays off in terms of sales promotion value to the client.

Graphic design covers such a wide variety of aspects that it would be impossible within the terms of reference of this book to deal adequately with them. The reader is advised to make use of the many possibilities for further education: art and technical college courses, Public Libraries and the more specialised printing and design libraries such as St. Bride's, the Victoria and Albert Museum and the Council of Industrial Design. Many of the books given in the bibliography are generally available or obtainable from local Public Libraries. In this way a whole new field of vision will open up, and the broad principles outlined above will be seen to be capable of infinite enlargement, and applicable to much more than the original theme.

9. Typeface Nomenclature and Measurements

Before proceeding with typography generally, it is necessary to understand typeface nomenclature, and the basic method of type measurement.

Nomenclature

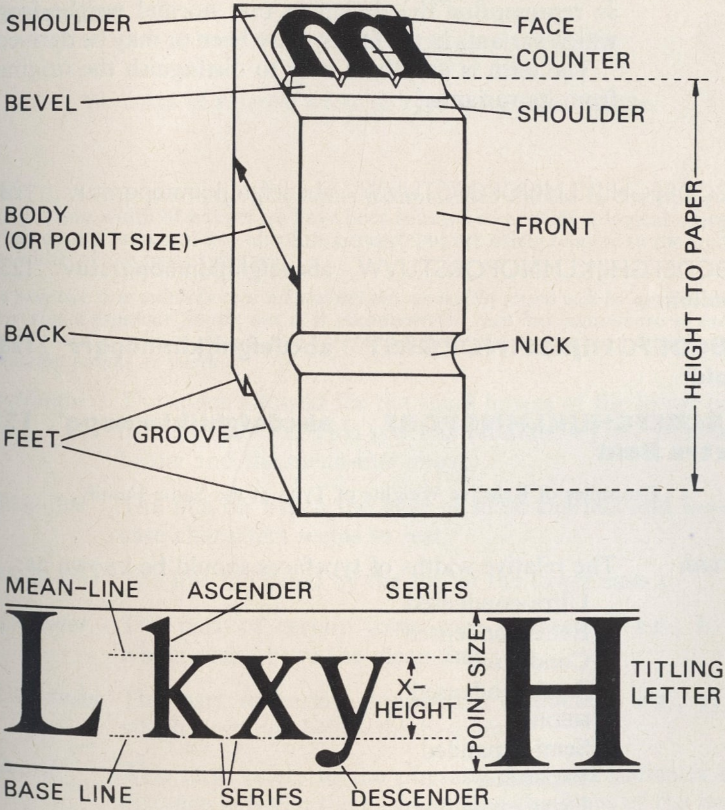
The following descriptions have been extracted from the appropriate British Standard.

Type	A relief stamp of metal or other substance, cast or engraved, used in the composition of printed matter.

Ligature	The joining stroke which connects any characters, as in fi, ffi, and by extension, the characters themselves.
Fount	A collection of matrices, type or characters of a given typeface and size.

NOTE. From the compositor's point of view, this would be a case equipped with a sufficient quantity of types for the kind of work being undertaken.

Typeface	A set of characters for printing intended to be used in combination, identifiable by their design, and usually available in a range of sizes.


SHOULDER
FACE
COUNTER
BEVEL
SHOULDER
BODY
(OR POINT SIZE)
FRONT
HEIGHT TO PAPER
BACK
NICK
FEET
GROOVE
MEAN-LINE
ASCENDER
SERIFS
L k x y
X-HEIGHT
POINT SIZE
H
TITLING LETTER
BASE LINE
SERIFS
DESCENDER

Typeface Nomenclature.

Family A group of typefaces which are derived from one basic design, and which may vary in weight, width or other special treatment.

Weight The degree of blackness of a typeface.
The relative weights should be known as:

Extra-light
Light
Semi-light
MEDIUM
Semi-bold
Bold
Extra-bold
Ultra-bold

By "medium" weight is meant the weight which the manufacturer puts forward under the name of the family as representing the design in that normal weight from which variants in the family have been or may be derived.

The term is used here only to distinguish the original from its variants.

ABCDEFGHIJKLMNOPQRSTUVW abcdefghijklmnopqrstuv 1234
Light

ABCDEFGHIJKLMNOPQRSTUVW abcdefghijklmnopqrstuv 1234
Medium

ABCDEFGHIJKLMNOPQRST abcdefghijklmnopqrs 1234
Bold

ABCDEFGHIJKLMNOPQRS abcdefghijklmnopq 123
Extra Bold

Examples of Relative Weights of Type of the Same Family.

Width The relative widths of typefaces should be known as:

Ultra-condensed
Extra-condensed
Condensed
Semi-condensed
MEDIUM
Semi-expanded
Expanded
Extra-expanded
Ultra-expanded

By "medium" width is meant the width which the manufacturer puts forward under the name of the family as representing the design in that normal width from which variants in the family have been or may be derived.

The term is used here only to distinguish the original from its variants.

ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstwxyz 1234567890
Extra Condensed

ABCDEFGHIJKLMNOPQRST abcdefghijklmnopqrstuv 12345678
Condensed

ABCDEFGHIJKLMNO abcdefghijklmnopqrst 12345678
Bold

ABCDEFGHIJKLMNO abcdefghijklmnopqr 123456
Expanded

Examples of Relative Width of Type in the Same Family.

NOTE. *Weight and width.* The terms recommended for use in describing the weight and width of a typeface have been selected to provide a logical scheme. They do not represent any absolute concept but are solely relative to the weight or width of the basic typeface.

In practice it is unlikely that all the weights or widths listed will be applicable to any single typeface family but it is recommended that any manufacturer introducing new typefaces should give careful consideration to the term he selects to describe weight or width.

x-Height	The space allowed for the small letters of the lower case fount, *e.g.*, x, z. This space is bounded by the base-line below and the mean-line above.
Base-line	The line on which the base of most capitals and lower-case characters seems to rest.
Mean-line	The line indicated by the top of the lower case x.
Ascender	The part of certain lower-case characters, *e.g.*, b, h, which rises above the mean-line.
Descender	The part of certain lower-case characters, *e.g.*, y, g, which descends below the base-line.
Beard	This term refers to the physical type and indicates the distance between the base-line and the front of the body of the type.

Titling	A fount manufactured specifically without lower-case, and usually having minimum beard.
Inline	A typeface which has a white line within the shape of the character.
Outline	A typeface in which a continuous line of more or less consistent width outlines the shape of the character.
Shadow	A typeface in which a three-dimensional effect is created.
Monoline	Any typeface in which all strokes of the letters are apparently of equal thickness. Most lineales and slab-serifs are monoline.
Bracketed (of a serif)	Connected to the main stem by a continuous curve.
Numerals	The characters 1 2 3 4 5 6 7 8 9 0. NOTE. It is strongly recommended that the word "figure" should not be used to denote numerals.
Latin	The use of this word for a kind of display letter characterized by wedge-shaped serifs is deprecated, and the term should be used to distinguish the letter-forms used in Western Europe from others, *e.g.*, Cyrillic, Arabic, etc., which are referred to in the industry as "exotics" but would be more conveniently referred to as "non-latin."
Roman	That group of alphabets in the printers' fount which is distinguished from italic by verticality and the shape of certain lower-case letters.
Italic	That lower-case and its accompanying capitals which is used as subsidiary in the printers' fount and is distinguished by the slope and, in the case of lower-case letters, by the shape of certain letters.

Measurements

Type sizes are measured and denoted in "points." A point measures $\frac{1}{72}$ of an inch (0·0138). Type size ranges from 4 point to 144 point, but the most widely used sizes range from 6 point to 72 point. The smallest size that is intended for easy reading is 8 point.

It should be noted, however, that the type point size relates to the body size, and not to the type face size. The difference between the face and body point size is taken up by the shoulder (see illustration). Further, the same point size can vary in different type faces, *i.e.*, 10 point "A's" will vary in height over different type faces. The type face height of the small letters of lower case type is referred to as the "X" height of a particular fount of type.

Spacing material such as "leads," "slugs," "rules" and "borders," are also measured in point sizes, *i.e.*, "2 point lead," "6 point slug," etc.

Line lengths are denoted in "picas." The pica is the standard unit of measurement in the point system and is the equivalent of 12 points. It is in fact the width of the letter "m" in 12 point type. Therefore 12 points being approximately $\frac{1}{6}$ of an inch, there are 6 picas to the inch (or 72 points). Twelve point "ems" for linear measurement should always be stated as "pica ems" to avoid confusion with body size ems (see below). In fact, it is better to refer to the measurement simply as picas. Depth of copy is also measured in picas.

The EM is the square of the type body of any size of type and is used for measuring the quanity of type. An EN is half the size of an EM.

Spacing each line of type, whether set by hand or machine, to the precise length, is termed justification.

10. Typography

Typography in its simpler forms should be comprehensible to anyone whose business is with paper, words and display. *It does not*, as does graphic design, presuppose some artistic ability and a reasonable competence with pen, brush and colour. *It does* require an aptitude for logic and orderliness, the ability to group words in a visually pleasing manner, whilst having regard to the relative importance of each group. Provided that some working knowledge exists about the physical possibilities of setting type, and some reference is available for the basic type faces, help can be given to the customer who wants a letter-heading, an invitation for a special occasion or a business card. So often, for the want of this help, the customer is provided with a "scrap-book" (the word is used advisedly) of styles which have been used for generations, and which bear little relation to the present times. So, a manufacturer of a splendidly up-to-date product—the latest thing in plastics or corrugated paper—is led by the nose to the use of a card on which his name appears in copper-plate characters of the last century, or worse still some later "adaptation" of what is basically a beautiful letterform when used in the correct context.

From this illustration it will be seen that the first fundamental of any design work also applies to typography—the selection of components with the ultimate use of the product in mind. Much depends on the location of the stationer, and the availability of a first-rate printer who is willing to help a potential customer to acquire information about the type faces held in stock, the cost of buying in special lines of type from trade setters, the sort of machinery available, and an idea of the cost of one or two jobs for which he is often asked.

Specimen sheets of a wide range of typefaces should be acquired, though one or two of the proven "favourites" are usually held in quantity by any printer. The most generally popular are Baskerville,

This is Baskerville type set in 12 point. The quick brown
This is Baskerville Italic set in 12 point. The quick brown fox ju

This is Imprint type set in 12 point. The quick brown fox
This is Imprint Italic set in 12 point. The quick brown fox ju

This is Times Roman set in 12 point. The quick brown f
This is Times Italic set in 12 point. The quick brown fox ju
This is Times Bold set in 12 point. The quick brown fox ju

This is Garamond type set in 12 point. The quick brown fo
This is Garamond Italic set in 12 point. The quick brown fox jum

This is Plantin type set in 12 point. The quick brown fox
This is Plantin Italic set in 12 point. The quick brown fox j
This is Plantin Bold set in 12 point. The quick brow

This is Bembo type set in 12 point. The quick brown fox jumps
This is Bembo Italic set in 12 point. The quick brown fox jumps over t

This is Scotch Roman type set in 12 point. The quick b
This is Scotch Italic set in 12 point. The quick brown fox

This is Gill Medium type set in 12 point. The quick brown
This is Gill Italic set in 12 point. The quick brown fox jumps o
This is Gill Bold set in 12 point. The quick brown fox

This is Univers Medium set in 10 Didot. The quick brown
This is Univers Medium Italic set in 10 Didot. The quick b
This is Univers Bold set in 10 Didot. The quick bro
This is Univers Bold Italic set in 10 Didot. The quic

This is Grotesque 215 type set in 11 point. The quick brown
This is Grotesque 215 Italic set in 11 point. The quick brown f
This is Grotesque 216 type set in 11 point. The quick b

Specimen Type Faces.

Imprint, Times, Garamond, Plantin, Bembo and Bodoni (seriffed faces) and Gill Sans, Univers and the Grotesques which are now so much used in display and tabular work. The last three (see examples) will be seen to differ from the seriffed faces in that the strokes of the individual letters terminate in a squared-off form, and not with the fine cross-strokes which finish the other typefaces. These cross-strokes are, of course, the serifs. The difference in thickness between the strokes forming the letters of sans serif types is minimal by comparison with those of the seriffed faces, and so the overall appearance of the two groups is strikingly different. Thus the typographer must be sure that his choice from either group is appropriate to the job in hand.

Each seriffed typeface consists of capital letters, small capitals, lower case roman, italic capitals, lower case italics, numerals, both roman and italic; and in addition bold, light, condensed and expanded versions of the same letter forms are often provided. With this as his "palette" the typographer can plan his layout. At this point the second of the design principles is needed–simplicity. With such a choice before him, the amateur is tempted to use as many variations as possible, with disastrous visual results. One of the first aims of a good typographer is to make the message which he has been asked to convey as easy to read as possible. To this end all unnecessary punctuation, particularly in display lines should be eliminated (the conventional full stop after Mr and Mrs, *eg*, am and pm, etc., and in well-known capitalised abbreviations such

CAPITALS. ABCDEFGHIJKLMNOPQRSTUVWX

SMALL CAPITALS. ABCDEFGHIJKLMNOPQRSTUVWXYZ

lower case. abcdefghijklmnopqrstuvwxyz

italic lower case. abcdefghijklmnopqrstuvwxyz

ITALIC CAPITALS. ABCDEFGHIJKLMNOPQRSTU

1234567890 *1234567890* **1234567890**

BOLD CAPITALS. ABCDEFGHIJKLMNOPQRSTU

bold lower case. abcdefghijklmnopqrstuvwxyz

UNIVERS LIGHT. The quick brown fox jumps over the lazy dog.

UNIVERS MEDIUM. The quick brown fox jumps over the lazy do

UNIVERS BOLD. The quick brown fox jumps over the lazy

Types of Character to be Found in a Fount of Type.

as USA, UNESCO) together with the conventional dash after a colon (:—). The colon on its own is quite sufficient, and all these little spots on the paper come between the reader and the printed word, and so make for slower comprehension. However, elimination of punctuation can be carried too far, when an address set in one line lacks any commas, or even extra space to break the address into its parts: but if an address is set ranged left in separate lines, no commas are necessary.

193 Trumpington Street, Cambridge

193 Trumpington Street
Cambridge

Address Setting With and Without Punctuation.

With these simplifications in mind, the typographer chooses the typeface most suited for the dominant copy in the job. For instance, consider the example of a letterheading for a bookshop. A "scholarly" letterform with an historic flavour (without going to the extreme of the Gothic blackletter so beloved by dealers in antiques) might indicate the absolute dependability of this bookseller to provide the correct volume for any student on any subject. Bembo has been chosen, though Baskerville might have been an alternative. The character of the Bembo italic lower case is so beautiful and forms a good contrast to the large and small capitals, and is a fitting choice for this University bookseller. The information appears in the most logical order: the name, what is sold, the address, and the alternative means of communication with him.

JAMES PINDER

UNIVERSITY BOOKSELLER AND STATIONER

193 Trumpington Street, Cambridge

TELEPHONE: 246   TELEGRAMS: PINDERCAM

Example of Letterheading for a Bookshop.

Other letterheadings may not be so easy to resolve, where the client demands a list of directors or products of the firm, together with a trade mark and/or trade association emblem. Here, all the typographer's knowledge and tact will be needed to persuade his client that it is not in his best interests to clutter the heading with so much information; or, if the client is adamant, the typographer must organise all these elements into a tidy and visually acceptable pattern, using weight or size of type to denote importance of information, and to relate the trademark to the typography as well as possible. Here, as in any design, the use of space is as important as the use of the correct type. Some typefaces, such as Bodoni, with a strong vertical emphasis, need more leading (space between the lines of type achieved by the printer with the insertion of strips of lead spacing material) to avoid a dazzling effect which arises out of the contrast between the thick and thin strokes of the letters as well as the direction of emphasis. Leading is also useful to divide groups of information, or to provide enough space around an important line of type to give it more prominence than the rest, without increasing the type size or weight.

In setting text matter, consideration must be given to the length of line which it is possible for the eye to scan. As a generalisation, a type size should be chosen which will give an average of ten words per line, and this may be regulated in turn by the size of the page on which the text matter is to appear. Currently there is an increase in the use of A4 (11¾ in. × 8¼ in.), an international standard paper size, for annual reports and similar publications. Here, the typographer has to decide whether he will design the pages to use a two-column setting in a small size of type, with rather skimpy margins; or by using a single column setting in a size of type more appropriate to the page, to take advantage of the wider margin thus obtained for the display of side headings. In two-column setting the average number of words per line should be fewer than ten, but more than four.

Leading plays a great part in the legibility of text setting as well as in the display setting of the letterheadings previously mentioned. At this point another factor in type design should be mentioned: the x height. This is obviously the height of the letter x (lower case) and is used to make a comparison between the length of the ascenders and descenders (the tail of the d, b, h, k, etc., and the p, q, y, j, etc.) in different typefaces. Examine, for instance, the appearance of these features in samples of Bembo and Times Roman. Bembo, where the x height in relation to the ascenders and descenders is small, is said to be "small on the body" and Times by contrast "large on the body." The body referred to is the rectangular-faced piece of metal on to which the shape of the individual letters is impressed, and size of type (10 point, 12 point, 48 point, etc.) are so called from the size of the body. So 12 point Bembo and 12 point Times, whilst having a common body size, are quite different in appearance partly because of the difference in the length of their ascenders and descenders.

This is Bembo. This is Times.

Difference in X Height between two 12 Point Type Styles.

Explanation must now be made of another printing and typographical term used more than once already. That is the weight, or "colour" of type. This can be demonstrated easily by comparison of a paragraph set to the same measure (or length of line) and the same amount of leading in Bembo, and in Times Roman. Setting in the latter typeface results in a much blacker area of type than the setting in Bembo.

Yet the total height, above river level, of this helpful ridge, of promise as a pathway and as the site of a trading town, was modest to a degree. Yet so small an elevation was enough, in time, for dryshod tramping and unflooded settlement.

Yet the total height, above river level, of this helpful ridge, of promise as a pathway and as the site of a trading town, was modest to a degree. Yet so small an elevation was enough, in time, for dryshod tramping and unflooded settlement.

Example of Weight or Colour of Type.

Thus the Times setting is said to have more weight or colour on the page, and was designed by Stanley Morison for The Times newspaper, to have maximum legibility whilst occupying a minimum space, and for printing on newsprint. It would be wrong, though, to make a sweeping statement that Times Roman, because of its weight, is the most legible typeface. Compare the colour—the actual colour this time—of newspaper with a sheet of ordinary typing bond, or a sheet of white notepaper. The newsprint is a cheap paper lacking the whiteness of the other two, so that a typeface of a strong "colour" is required for maximum legibility on this paper.

This leads to another factor in the typographer's choice of typeface for a particular job: on what paper will it be printed? Or, to put it another way round, what paper should he recommend to get the best results from the typeface he has specified in his design? Economics may dictate which of these considerations should be first; a beautiful job may be produced on a handmade or antique paper in Bembo or Caslon, but the result may not be suitable to the purpose of the job and the cost may be similarly unrelated. Nevertheless, it is essential to know, before specifying any typeface, what process of reproduction will be used—and by implication the length of the run—and what type of paper. The printed result of Bembo on a calendered or art paper will appear spidery by comparison with the same type printed on an antique paper for which it was designed. Caslon Old Face, also designed for printing on dampened antiques with a heavy impression, appears in a recut version by Monotype Corporation as Imprint, and was particularly cut for the lighter "kiss" impression of modern printing machines. Caslon Old Face should not be used on smooth-surfaced paper: Imprint is seen to better advantage on antique, but may be used on coated paper.

The sans serif faces are generally most suited to smooth surfaced paper, and are very useful for catalogue or tabular work, as their uniformity of "colour" which may be relieved by bold face cross-headings or titling, gives a neat, business-like appearance and a clear presentation of information—providing, of course, that the typographer and printer have done their work well.

So far nothing has been said about mixing different typefaces. This is best avoided by any but trained typographers, but as it may well be that a stationer is asked by a customer for a design composed of a bold line of Gill Sans (the customer may not know the name of the type, but will point it out as "That block lettering there" and the rest in "The stuff that everybody's using these days"—which, interpreted by the local printer will turn out to be Univers or Grot. No. 2, a word of warning may be appropriate. All sans serif types do not mix happily with one another: their only common factor is the lack of serifs. The style of the typeface, its austerity or flamboyance, the similarity of origin or age, will determine whether or not it will mix well with another type. Unless a typographer has been commissioned who knows his business, persuade the customer to stick to different sizes or weights of the same face. There is considerable variety to be had.

CHAPTER 12

Artists' Materials

The field covered by the term "Artists' Materials" is an extremely wide one, and in the space of a single chapter it is not possible to provide more than a résumé, but it is hoped that this will serve as a basis upon which a more comprehensive knowledge may be built, for this is an important aspect of the stationery trade with which every versatile assistant should be acquainted.

The catalogues, the tint cards, and even the labels issued by reputable suppliers carry a wealth of information which will amply repay careful attention, while further help and guidance may always be obtained from the manufacturers or their representatives, who are trained in the technicalities of this specialist trade. A great deal of information may also be gained by perusal of elementary textbooks on the various branches of art, while study of magazines on the subject will keep the assistant up to date. It should be remembered, too, that many of the retailer's customers will probably have long and specialized experience behind them which normally they will be very willing to share.

Here an attempt is made to give a brief introduction to some of the more important lines of the artists' materials trade. They may be classified into twelve main groups.

1. Oil Colours

Oil colour painting today is the culmination of centuries of experiment with materials, methods and techniques. The range of colours is rather greater than that supplied for the water-colourist and the artist's choice of his "palette" is more individual, for a different approach to any given subject may change entirely the selection of colours. However, as some guide to the assistant, the following colours may be said to form a normally accepted palette:

Alizarin Crimson
Vermilion
Light Red
Indian Red
Raw Sienna
Burnt Sienna
Payne's Gray
Raw Umber
Burnt Umber
Yellow Ochre
Cadmium Yellow
Cadmium Yellow Pale
Viridian
Cerulean Blue
Cobalt Blue
French Ultramarine
Phthalocyanine Blue (under various trade names)
Flake White
Ivory Black

"Artists' Quality" Oil Colours: These comprise the more expensive quality and are made without regard to the cost, each manufacturer making as high a quality as he is able—and the British manufacturers have a very high reputation in this respect.

In very general terms, artists' oils are a paste consisting of pigment finely ground in oils, of which linseed is the most common. White, usually Flake White or Titanium White, but sometimes Zinc White, is used a great deal in oil painting, for nearly all colours are mixed with a greater or lesser amount of white on the palette prior to application to the prepared oil painting ground, which may be canvas, millboard, wood, or even paper. As oil colours are comparatively slow drying, a far greater measure of deliberation and scope for alterations or correction is available to the painter in oils than is the case with the artist using water colours, the beauty and finesse of whose work depends on deftness and precision at the first application.

Oil colours are marketed in several sizes and the demand varies considerably. Professional artists, and amateurs who do a great deal of work, will prefer the larger tubes, for these show a substantial saving to the purchasers, but, where the bulk of demand comes from amateurs who only paint occasionally, the single tubes find the greatest sale.

Artists' Oil Colour Permanent Blue
Artists' Oil Colour Aureolin
Artists' Oil Colour Cremnitz White
MADE IN ENGLAND
Artists' Oil Colour Scarlet Vermilion

Artists' oil colours.

A guide to permanence may be found by study of labels and catalogues, and the term "permanence" in relation to oil colours means durability when laid on ordinary prepared canvas and exposed freely for a series of years in a dry room to ordinary daylight.

"Second Quality" Oil Colours: These colours are usually of a high quality, but, unlike artists' oils, are sold at a uniform price. Many of the pigments are similar to those used in the artists' quality, although not of the same high grade. Very expensive pigments, such as cadmiums, cobalts and vermilions, are replaced by organic pigments made as near as possible to the hue of the artists' colour of the same name; it is usual to see the word *hue*, *tint* or *syn.*(*thetic*), or details of the organic pigment incorporated in the colour name, thus denoting that the colour is not made from the costly artists' pigment.

Oils and Mediums

Oil colour may be used straight from the tube, but most painters use a medium to adjust the consistency and final effect.

Distilled turpentine is used for thinning oil colours; it is particularly useful in the underpainting or first stages of a picture. If much is used the paint loses its natural semi-gloss.

An oil-based medium is generally mixed with the colours in the later stages of a painting. A popular medium is a mixture of refined linseed oil and turpentine, as also is a mixture of equal parts of linseed oil, turpentine and copal varnish, which imparts a gloss to the finished painting. A medium based on stand linseed oil is particularly good, for it is more durable and unlikely to yellow with age as ordinary linseed oil is liable to do. Beeswax forms the basis of a matt-drying medium. Most of the constituents mentioned are available separately, and the mixtures are also supplied ready prepared.

As a result of the modern development of synthetic resins, new jelly oil painting media have been introduced. They are very durable, quick-drying and non-yellowing, and, being packed in tubes, they are particularly easy to use.

Varnishes

A finished oil painting is varnished in order to protect it from dust, to enrich the colour tones and to give it a uniform finish, which may be glossy, matt or an intermediate effect.

When an oil painting is touch dry it may be treated with a retouching varnish. Such a varnish contains only a small proportion of resin, either damar or a synthetic type, and so it permits the oil colours to oxidize and dry thoroughly, a process which may take up to a year. Only then may a final picture varnish be used. Many varnishes are available, but they may be divided into three main groups.

(1) Those based on synthetic resin, and sold under various trade names, are to be recommended for varnishing oil paintings. They are colourless, easy to apply, give no trouble, and are

easy to remove by means of white spirit (turpentine substitute) when cleaning is necessary. Most provide a gloss, but matt varnishes are also available.

(2) Those based on natural resins such as damar or mastic may also be used as picture varnishes. They are simple to remove when necessary, but mastic varnish has a tendency to "bloom" or form a whitish haze on paintings under certain conditions.

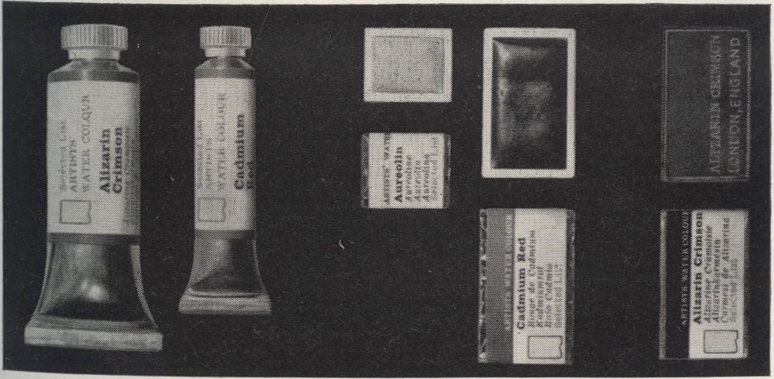
(3) Varnishes containing resin fused with oil were at one time used as picture varnishes, but, as they tend to yellow with age and are virtually impossible to remove, they should not be sold for that purpose. Thus, despite its name, Picture Copal Varnish should never be sold for varnishing pictures. Its main use is as part of a painting medium.

Varnish may be applied by means of a broad, flat varnish brush or by spray. Some are supplied in aerosol containers. A matt-drying wax varnish supplied in paste form is usually applied with a cloth.

2. Water Colours

Water colour painting is perhaps the most delicate and exquisite of the graphic arts, and it is in an especial sense an English art, for it was in this country that it was first recognized as a definite artistic pursuit and, in time, came to rival oil painting.

Careful thought and investigation, together with sound chemical knowledge, have resulted in the manufacture of water colours which, for beauty of colour, excellence of working and durability are as near perfection as possible.



Artists' water colours.

The assistant should be able to recommend an inexpensive palette for *ordinary* purposes, making the selection from:

Alizarin Crimson
Burnt Sienna
Burnt Umber
Chinese White
French Ultra
Gamboge or New Gamboge
Hooker's Green No. 2 (Dark)
Lamp Black
Lemon Yellow
Light Red
Payne's Gray
Permanent Blue
Phthalocyanine Blue (under various trade names)
Raw Sienna
Raw Umber
Sepia
Venetian Red
Yellow Ochre

He should also make himself familiar with the most *generally useful* water colours, which are:

Alizarin Crimson
Aureolin
Burnt Sienna
Burnt Umber
Cadmium Red
Cadmium Yellow
Cadmium Yellow Pale
Cerulean Blue
Chinese White
Cobalt Blue
Crimson Lake
French Ultra
Gamboge or New Gamboge
Hooker's Green No. 2 (Dark)
Lamp Black
Lemon Yellow
Light Red
Payne's Gray
Permanent Blue
Phthalocyanine Blue (under various trade names)
Prussian Blue
Raw Sienna
Raw Umber
Rose Madder
Scarlet Lake
Sepia
Venetian Red
Vermilion
Viridian
Yellow Ochre

Cadmium Red may be recommended to customers who find the very high price of Vermilion prohibitive, and this applies also to artists' oil colour.

"Artists' Quality" Water Colours: These are the highest quality possible and are essentially pigments ground with gum to achieve a transparent form of painting where the white of the paper provides the lights. Generally, therefore, very little white (known as Chinese White) is used. The artists' water colours made by British manufacturers are world-famous and are made to most exacting standards.

Artists' water colours are produced in two forms—dry (cakes and hexagon sticks) and moist (pans and tubes). Moist colours are in the greater demand, and the best-selling lines are half pans and whole tubes. Cake colours are most often used by architects and draughtsmen. It should be noted that:

(*a*) A dry colour must be rubbed down with a little water in a saucer in order to obtain a wash. A wet brush is never applied to a cake as it is to a pan of moist water colour.

(*b*) Pans should never be refilled from tubes. Pan colour is specially made to remain moist when left exposed to the air, while tube colour is intended to be kept sealed until required for immediate use.

These points supply the answer to the cute customer who contends that a half cake fills an empty whole pan or that several half pans can be filled from one whole tube.

In addition, the assistant should be able to recognize the permanent colours, and this he can do by means of the manufacturers' code on the labels. By the permanence of a water colour is meant its durability when washed on a suitable type of paper and exposed freely, under a glass frame in a dry room, for a number of years to ordinary daylight.

"Second Quality" Water Colours: These colours have the same relationship to artists' water colours as second quality oil colours have to artists' oil colours. They are referred to in some detail under the heading Educational Colours.

Water Colour Preparations: In general, water alone is used in conjunction with water colours, although some painters find occasional use for liquid gum arabic, which is supplied in bottles.

An impasto medium which enables water colours, particularly designers' gouache or poster colours, to be applied thickly with brush or knife is supplied in tubes.

Water colour paintings are usually framed behind glass, as most varnishes are liable to alter and lower the tones of water colours. A matt varnish is sometimes used, however, as it retains the matt finish of water colours and alters the tones less than other varnishes.

3. Poster Colours

The use of opaque colours, as distinct from the more transparent form of artists' water colours, continues to increase, mainly because of the development of commercial art as represented by poster design, ticket writing and showcards of all descriptions.

These colours dry with a matt or opaque finish—hence their name—and unlike water colours, where gradation is employed, are used in flat washes and can be superimposed one upon another. That is why they are so eminently suitable for posters and showcards.

It is desirable, therefore, to include a representative range of opaque colours in any general stock of artists' materials, for they are certain to be in demand.

Gouache colours are a special type of opaque colours of great brilliance. They are the finest of the commercial art colours, being finely ground, economical, and capable of superimposition one upon another.

POSTER COLOUR
oster White
POSTER COLOUR
Violet
POSTER COLOUR
Chinese White
POSTER COLOUR
Permanent Yellow Middle
POSTER COLOUR
Poster Red
POSTER COLOUR
Yellow Ochre
POSTER COLOUR
MADE IN ENGLAND
POSTER COLOURS

Poster colours.

Classified in degrees of permanence to light, their primary use is for textile designing, but they are also used for painting pictures in gouache (opaque) and high-class poster work, and industrial designers make extensive use of them.

This type of colour is given different names by the various makers, but the word " Designers' " usually appears in the title.

4. Educational Colours

In modern times educational methods have been revolutionized, and the old idea that anything would serve as long as some knowledge was instilled has passed. Now the cry is for the best possible, be it methods, materials or buildings. Unfortunately, from the point of view of education authorities, the best artists' materials are quite impossible by reason of their costliness. However, ranges of water and oil colours are produced for students' and school use, and their good quality combined with moderate cost makes them an ideal solution to the problem.

White
Lemon
Brilliant Red
Brilliant Green
Black
COLOUR BOX
To take out colour cups slide in this direction
Made in England
NEW ART POWDER COLOUR
COBALT TINT
NEW ART POWDER COLOUR
VERMILION TINT
OPAQUE WATER COLOUR

Powder, block and disc colours.

The experienced artist will know the difference between artists' and students' colours, but the question may often be asked by an amateur, especially if he is a beginner. The answer is that artists' colours are made as good as the maker knows how, no matter what the cost of raw materials or manufacturing processes, while students' colours are made to the highest possible standard within the limits set by a uniform, moderate price. Obviously, no maker can use pigments costing pounds per ounce for colours selling at a relatively low price, so imitative colours have to be prepared.

As already explained in connexion with second quality oil colours, the colour name is qualified if the colour concerned is not prepared from the genuine pigment which would be understood if no such modification were included in the title. This is equally true for second quality water colours.

Between the students' water colours and toy paints there is a very big step downwards. There are always on the market boxes of paints which are not really suitable even for the colouring of painting books by the youngest children, for these paints are heavily loaded with such substances as china clay, and very little colour is yielded from them. It is always good advice to suggest that reputable water colours should be purchased even for children's use as they are not expensive, are very much more economical in use, and give a much greater degree of satisfaction.

Powder colours, known by different trade names, are extensively employed in schools nowadays. They are ready mixed with the medium in a dry state and need only the addition of water for use. They are extremely economical and are most valuable for the free-expression art work now taught in most schools.

A development from this is the solid block of compressed colour, which overcomes the objection that some teachers have to the "messiness" of powder colours. The use of such blocks of opaque colour involves a greater outlay at the start, but over a period they are equally economical.

5. Acrylic, Emulsion and Polymer Colours

This group of colours consists of pigments bound in an emulsion based on synthetic resin. They are supplied in tubes and pots in a consistency which is suitable for fairly thick application by means of brush or knife to board, canvas, paper or virtually any type of painting support. Alternatively, they may be diluted with water and applied thinly. They are very quick-drying, but the drying time may be retarded by spraying the paint surface with water. Once dry, they are thoroughly waterproof, may be overpainted, and are almost irremovable.

The colours have a semi-matt finish. Glossy and matt-drying emulsion media may be used in conjunction with them, and the media may also be used for varnishing finished paintings. Any of the picture varnishes normally applied to oil paintings may also be used on paintings in which emulsion colours have been used.

6. Oil Painting Supports

Artists' canvas is the ground most used for oil paintings. It may be made of flax (linen), cotton, or a mixture, and is generally woven in many textures to give a variety of painting surfaces. A single primed flax canvas and a cotton canvas are indispensable to a normal stock, and further varieties may be added according to the demand.

Pattern books are usually available and these, used in conjunction with the illustrated catalogues and descriptive matter contained in them, give full details of the complete ranges.

Before use, the canvas is strained on a wedged stretcher, and this work is usually done by the manufacturers, although some fine art dealers still do their own straining. If at the time a strained canvas is sold it has lost its tautness, this may easily be restored by lightly tapping the wedges at each corner until the stretcher has been sufficiently enlarged to take up the slack.

Canvas boards, which consist of canvas glued down on strawboard, are popular for outdoor sketching studies, as they are cheaper and less bulky than strained canvases. These boards are known by various trade names.

Other popular supports for oil painting are oil sketching boards in which the priming is applied directly to the board, and hardboard which the painter may prepare himself with special oil painting primer sold in ½ pint tins. Oil sketching paper is the cheapest and lightest form of oil painting ground.

7. Paper

Different types of paper are available for all forms of painting, drawing and lettering. The best, and most expensive, papers for water colour painting are hand made in various weights, sizes and surfaces. They generally have a more varied and interesting texture than mould-made papers, but most of the latter are of excellent quality and many painters find that they suit all their requirements. Most water colour papers are available in hot pressed, not or rough surfaces; hot pressed is used for paintings incorporating much drawing or fine detail, whereas not is a useful surface for general purposes. Rough surface is most often used for bold water colour painting incorporating broad washes.

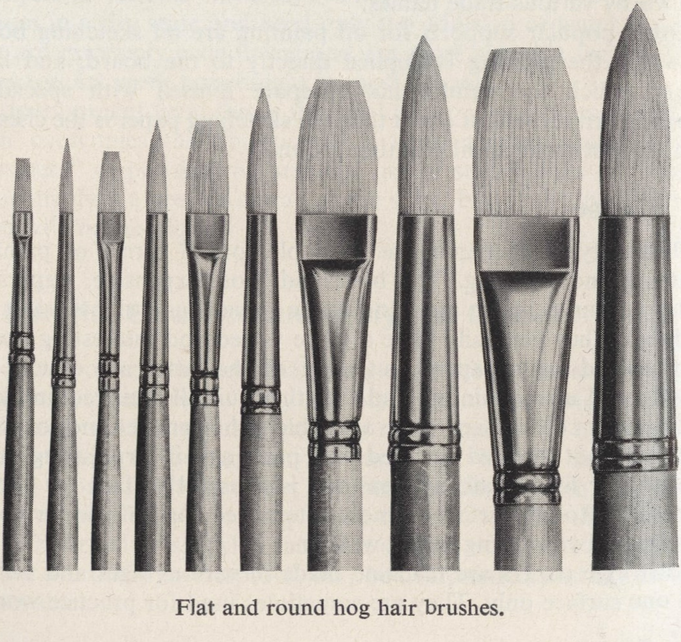
Cartridge papers are machine made in various sizes and weights but one surface only. They are sometimes used for practice work in water colours, although they are primarily intended for drawing, as they are made to withstand the use of an eraser. Many water colour papers and cartridge are made up in the form of sketch blocks and books.

Some mould-made water colour papers are tinted. Other papers which are machine made in bright colours are often used with opaque water colours (designers' gouache and poster colours). Paper for pastel work is supplied in white and a range of subdued colours.

Oil sketching paper is mentioned above in connexion with oil painting supports. It is non-absorbent and is, therefore, suitable for oils and acrylic colours but not water colours.

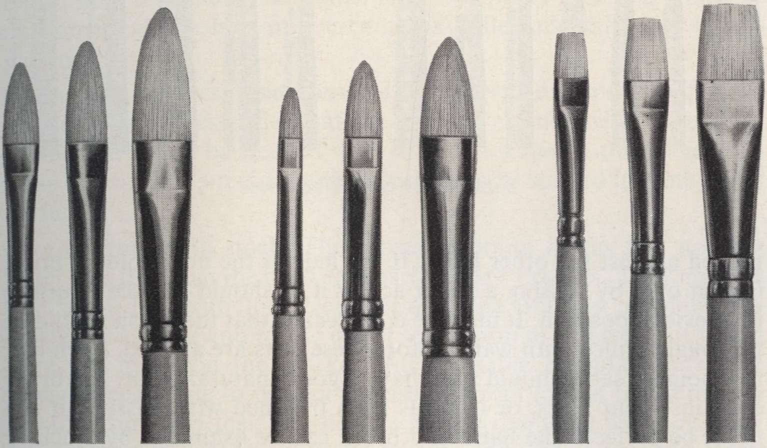
8. Brushes

Oil Colour Brushes: The rather bewildering range of brushes for oil painting is made necessary to meet the demand caused by the many techniques employed today. It is customary to stock at least three different flat varieties and one round series, all made from hog hair. Brushes of sable hair are also used for fine details in oil painting. The demand for oil sables is less than for hog hair brushes, but most painters in oils have at least one or two, so a series of round oil painting sable brushes should be stocked.



Flat and round hog hair brushes.

The hog bristle used in artists' brushes is graded according to quality, as it varies in softness and strength. Every brush is made by hand, and the workmanship makes a great deal of difference to the length of time each retains its original shape. It should be borne in mind that in oil painting the brush works in the nature of a flexible knife or trowel, placing the colours in layers on the prepared ground. Hog bristle wears down with use, but a well-made brush will hold its shape as the hair gets shorter. Bristle should on no account be cut or trimmed with scissors.

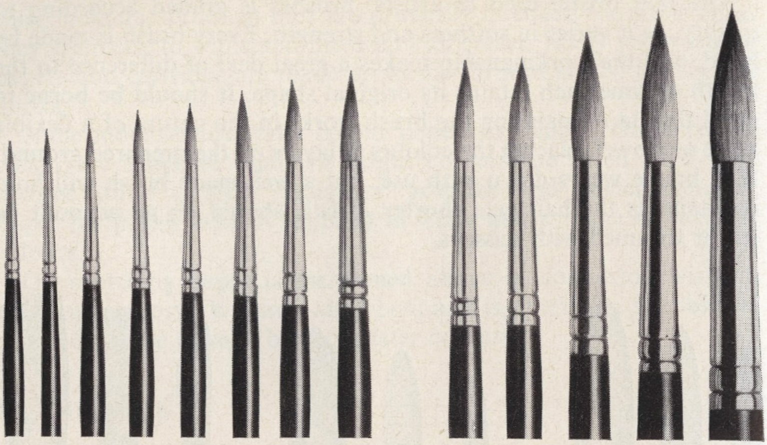


Filbert and thin flat hog hair brushes.

Water Colour Brushes: The finest brush for water colour drawing is undoubtedly the red sable, which is a painting instrument with unique properties. It has resilience, capacity for carrying colour, unrivalled ability to come to a finely tapered point—of great importance in water colour work—and, given proper treatment, it has a long life.

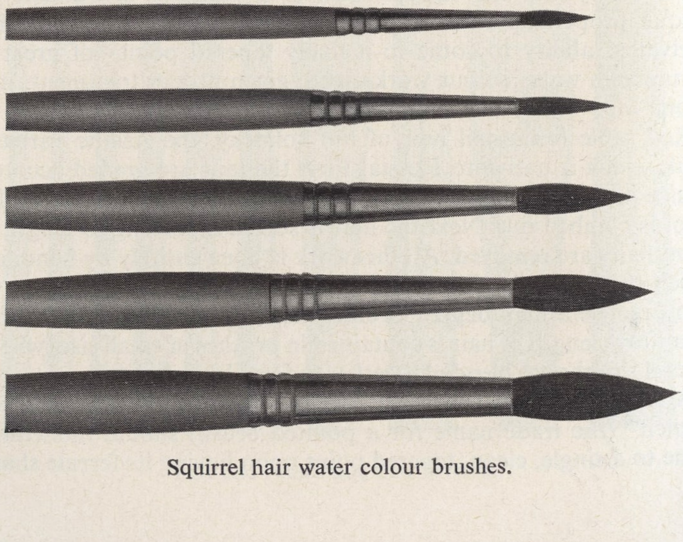
Red sable is the tail hair of the kolinsky, the Asiatic variety of mink which is native to Russia. First the tails are graded according to size and quality, after which the hair is cut from the tail and the wool is combed out. Next the hair is sorted according to length and blunt hairs are removed. All this work is done entirely by hand, after which the hair is sterilized and passed on to the brushmakers, who also practise a high degree of craftsmanship in shaping each brush. A uniform length of hair is contained in brushes of small size, whereas several lengths are blended together to form large brushes.

After having been thoroughly wetted in water, a well-made sable "pencil" (the trade name for a pointed brush) should immediately come to a single, clean, tapered point upon having its ferrule sharply



Sable water colour brushes.

tapped against the other hand. If the hair of the now pointed brush is bent over by passing a finger across it, it should at once return to its previous position. It must be emphasized that the brush should be thoroughly filled with water before these tests are applied. Each hair in a pointed sable should itself have a good, natural point. If a brush contains blunt hairs, or if it has been trimmed with scissors, it can never be perfect. The hairs of a brush can be examined by pinching the hairs close to the ferrule so that they form a fan which can be inspected against a piece of white paper. A pot of clean water should



Squirrel hair water colour brushes.

always be available for the testing of water colour brushes by customers. Most will insist on testing them, and will wet the brushes in their mouths if water is not available.

Water colour brushes are made in special shapes for different purposes, such as lettering, spotting, covering large surfaces, etc.

Sable hair is very expensive and, as a result, ox and squirrel hair are used for certain series of brushes. Good school brushes are usually made of squirrel, but the quality varies according to the species of squirrel used and the method of manufacture. It is interesting to note that the term "camel hair" so widely used is a complete misnomer, as the hair of the camel is quite unsuitable for brushmaking.

Brushes for Acrylics, Emulsions and Polymers: Any type of brush can be used, but it is essential that the brush is cleaned before the paint dries on it. It can be cleaned with soap and water at this stage, but, if the colour dries on it, then the brush must be soaked in methylated spirits.

Care of Brushes in stock: The larvae of house moths like nothing better as a diet than the most expensive artists' brushes. They must be kept away by scrupulous cleanliness of the drawers in which the brushes are stored and by the use of some form of deterrent, of which there are many on the market. All reputable manufacturers take special precautions to protect themselves from loss in this direction and to ensure that their brushes are always free from moth or moth eggs when sent out. Care should be taken to ensure that old stock is in perfect condition before new supplies are added.

9. Pastels

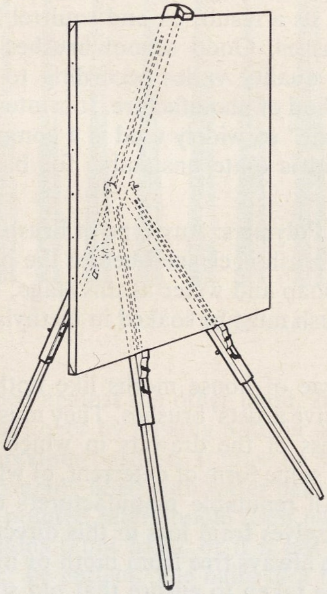
These small sticks of colour are available in two forms. The traditional variety is composed of pigment bound in gum, and oil pastels are, as their name suggests, composed of oil-bound pigments. Both types are made in an extensive range of individual colours, but they are normally sold in sets.

Pastels are used in a dry state and applied directly to the paper, usually a pastel paper with special surface which holds the particles of colour. Colour mixing is accomplished by blending different shades on the paper. Fixative is normally sprayed on to finished pastel paintings to prevent smudging, but oil pastels are smudge-resistant and so present less need for immediate protection by fixative or glass.

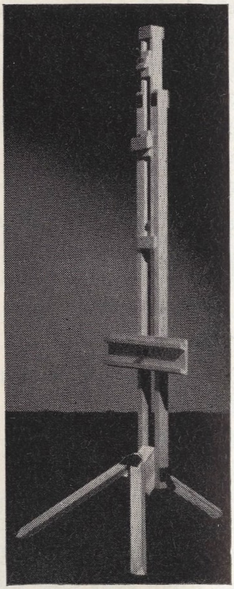
Artists' pastels are made from high-quality pigments, most of which have a good degree of permanence to light. They contain a high proportion of pigment to medium and they are, therefore, softer but more light-fast than crayons, which are intended for practice work and school use.

10. Easels

An extensive range of easels, made variously of American whitewood, beech, oak, and other timbers, is produced to cover every need.



Versatile tripod easel.



Students' radial easel.

The simplest tripod easel costs less than a pound, while the large studio easels with winding arrangements and forward movements are very expensive and nowadays available only as second hand. In most cases it is desirable to stock an inexpensive sketching easel, a better model adaptable for both water colour and oil colour painting and a students' easel of the "radial" type.

Sketching easels must be light in weight; all must be rigid, strong and adjustable for height and able to take different sizes of boards or canvases. A forward movement (that is, an arrangement to tilt the canvas forward) is desirable in an easel to be used for oil colour painting.

11. Sundries

Colours, brushes, papers, and canvas are undoubtedly the most important items of the artists' colourman's stock, but the number of other articles necessary to artists, draughtsmen and students is legion, and it is impossible to make mention of them here. Such things as drawing inks, pencils, erasers, etc., have, like paper, already been dealt with in this book, but for the many other articles reference should be made to manufacturers' catalogues, which will be found to be most informative, or to other books specially devoted to this class of trade.

12. Craft Materials

Most manufacturers include in their range materials that can be broadly classified under this heading. Whilst it is not the purpose of this handbook to deal with such products in any great detail, a brief mention is made for the interest of the student.

Photographic Retouching Materials: Process White and Process Black are used for retouching black and white prints, both being mixed together to produce greys. The most useful size is 1 oz., but 4 oz. and 8 oz. pots are also available.

There are many other types of retouching colours in a great variety of greys; these are available in most manufacturers' designers' colours in tubes, but special ranges are also produced.

For retouching, artists' finest quality pointed sable brushes in small sizes, 000 to 3, are most used. Special spotting brushes are made with a short length of hair for photographic work.

Photographic Opaque, a reddish brown colour of great opacity, is used for correcting negatives.

Lino Printing: This simple craft consists of transferring a pattern or design to a piece of linoleum; channels are cut round the design, so that, when the raised portion is inked and the lino is pressed on to paper, an imprint is made.

Special cutting knives in different shapes can be purchased to gouge out the lino. They are usually in sets of three or five different cutters with a handle. Two types of colour may be used, lino printing water colour, which has a large quantity of glycerine in it to keep the colour moist between prints, and lino oil colour. The necessary colours and equipment are available in linocraft sets.

Fabric Colours: Special ranges of colours are available for painting, stencilling or printing on fabrics. Most of the colours are waterproof and washable.

Glass Painting: Glass painting for ornamental decoration can be executed in artists' oil colours with a special medium. There are also ranges of transparent colours specially produced for the decoration of glass. Acrylic colours may be used on glass without any special medium.

Stencilling: Special stencil brushes are available from most manufacturers, and stencilling may be carried out in any type of water colour or oil colour. Cut stencils are available, usually in packets, from many manufacturers, either in special designs suitable for children, or in alphabetical or numerical series. Stencil paper is an oiled manilla which can be cut with a stencil knife to the required pattern.

Modelling: Modelling is becoming very popular in schools, and there are several types of material available. For non-permanent work, plasticine or similar modelling material is available by the pound in a number of colours or in sets. Modelling clay is available in two forms, in powder or moist, and is usually put up in polythene bags in units of 7 lb. weight. Other clays are available, most of which can be obtained from pottery companies. Modelling tools are made of boxwood or plastic, and are available in a large number of sizes and shapes.

Painting by Numbers: A large number of sets of pre-drawn pictures on oil sketching paper is available, each picture having various areas and details numbered as a guide to painting with the correspondingly numbered colours. The sets usually contain oil colours.

Gummed Paper Craft: This is a well-established handicraft, extensively taken up by schools and enjoying increasing popularity in the home owing to its educational and occupational value.

The use of brightly coloured gummed paper produces a sense of achievement and, provided that the requirements of the craft are realized, most pleasing results are possible. Even from the age of two years, simple designs can be made with the larger ready-cut geometrical pieces and the child can learn to fit these into the designs provided. Following on there are smaller artistic shapes which lend themselves to a variety of expression.

More ambitious designs can follow either with the use of papercraft stencils or free-hand paper cutting or tracing, and in this there is really no age limit. The poster artist can very well make use of gummed paper for large areas of colour, and for this he has the choice of both matt and glossy papers in a very wide range of colours.

One of the most popular forms of gummed papercraft is the composite gift box under specific titles such as nursery rhymes, silhouettes, flower craft, fun and mosaic, which make excellent gifts or prizes.

Briefly stated, gummed papercraft can be described as painting with paper, and its special appeal is in its cleanliness, brightness of colour, and the unlimited opportunities for personal expression. Obtainable with all the above items are round-point safety scissors, and a very attractive and inexpensive album of black pages which well displays the progressive work of the child.

CHAPTER 13

Drawing Materials

With the vast increase in technical education and the advance of technology in all industries, the demand for all types of drawing materials has increased enormously in recent years—so much so, that these materials now form an important part of the stationer's stock. It will be impossible to deal with the many items available but an endeavour will be made to include the main ones and facts that will enable the assistant to understand the purpose and use of the more important items. Such information should be supplemented by the studying of suppliers' catalogues, and this, together with experience acquired by the selling of such products, should enable the assistant to sell with confidence and knowledge.

1. Qualities

It must be clearly understood that the majority of materials fall into three general qualities, according to the requirements of the user.

Scholastic

This group covers the requirements of the majority of school children who have passed their eleven plus examinations and have commenced schooling at grammar or high schools, or who have proceeded to secondary schools. They require equipment for drawing lines and diagrams for general studies that are different from the items required for actual technical drawing. In addition, a question of cost is involved, so that the price range is at the lower end of the scale.

Technical

This quality and range is for the full-time or part-time technical students. They vary in age from the young person going to technical school for the first time to the university student completing his advanced studies, or students taking "sandwich" courses and trainees with large industrial firms. It will be realized that, with these different groups, the need for and use of equipment will also vary, as will the cost. The first-year student may be content with simpler and less expensive items, if he realizes that he may not be going into a profession where he would require the equipment to last a lifetime. On the other hand, where the student has made up his mind concerning his future employment, more expensive items will be bought to save future expenses.

Professional

Here the draughtsman, engineer, architect, surveyor and so on will be seeking the best quality, not only to last but to give complete accuracy. The instruments that they require are obviously the tools of their profession, and in consequence they will be more discerning in their selection.

B.S.I. Standards

Standards are published for certain drawing materials, principally for drawing office use. Since this chapter is mainly concerned with those materials for student and general use, no attempt is made to incorporate details of such specifications, although attention will be drawn to those articles for which standards apply. Materials made to these specifications may be marked accordingly.

Range

It has already been stated that the range of drawing materials is considerable, but they can be classified into certain well-defined groups, into which this chapter has been divided.

2. Scholastic Items

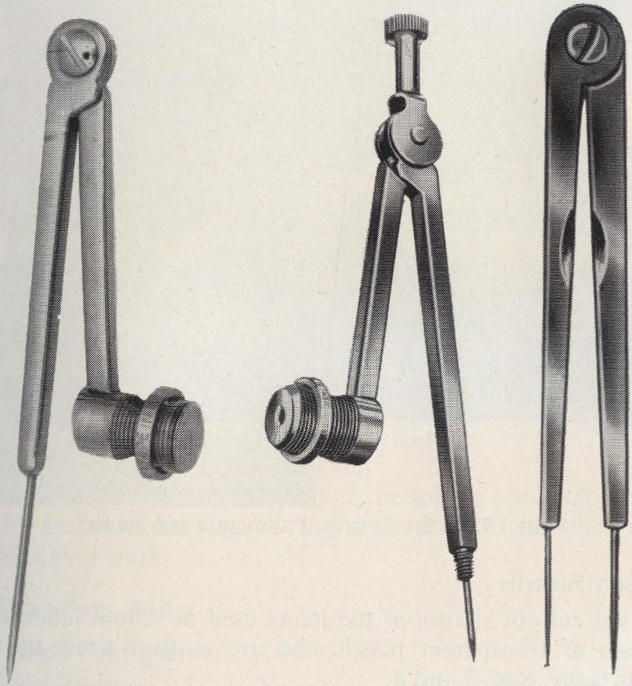
Under this heading are set out the various items that school children are likely to buy when they go to a high school or secondary modern school at the age of eleven plus. They are the items required to assist them with their homework and in some instances are items which are not provided for them by the school. Pens, pencils, erasers, books, etc., are dealt with in another chapter.

School Rules

These form an essential part of the school equipment and are in constant use for ruling lines, margins, etc., and for measuring in mathematics and geometry. The rule in most general use is a boxwood rule, double-bevelled with English and metric markings—*i.e.*, marked in inches, with various sub-divisions, and in centimetres and millimetres. Usually on the back are protractor markings. Boxwood is the most suitable wood as it is smooth and straight and the markings show up very clearly on it. At about half the cost is offered a similar rule in hardwood and, although its life will be very much less than that of the boxwood rule, it is of course bought on account of the price difference. Rules with similar markings, but six inches in length, are also bought, particularly by boys who like to carry one in their pockets. Also should be mentioned are rules in clear or opaque plastic which, with the improvements in plastic, are gaining in popularity. Usually they are not considered to be as satisfactory as wooden rules, as they break more readily and the markings are not so permanent.

School Compasses

The compass in most general use by this age group is the type which holds an ordinary pencil instead of the pencil lead, as is the case with the better drawing instruments. The compass holds the pencil by various means, the most usual being a ring which screws down on to the pencil. They are traditionally made of brass, often nickel plated, but, with the high cost of brass, compasses of nickel plated steel are also available. The size is about 4 in. and, in addition to the standard compass, the following variations can be obtained:—



School Type Compasses and Dividers.

Compass with bow—i.e., with small handle at top for handling.

Compass with safety bow—i.e., where the bow screws off to screw over the point.

Compass with safety points—i.e., where the point screws out and reverses to screw with the point inside the leg for safety.

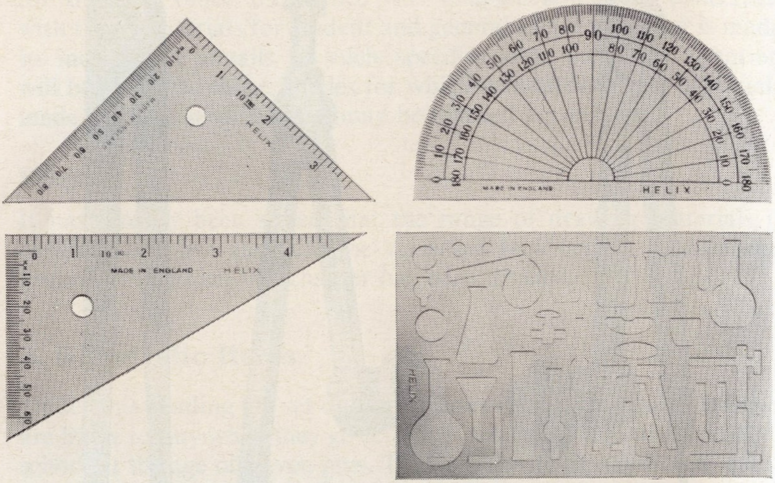
School Dividers

These are constructed similarly to the compass, but with two points instead of the pencil holder.

School Set Squares and Protractors

These are now invariably made of moulded plastic, approximately 0·06 in. thick, and are of the following specifications:—

Set square 45° 4 in. marked in mm. and 10ths of an inch.
,, 60° 5 in. ,, ,, ,, ,,
Protractor 4 in. semi-circle, marked in full degrees.



School Type Set Squares, Protractors and Stencil.

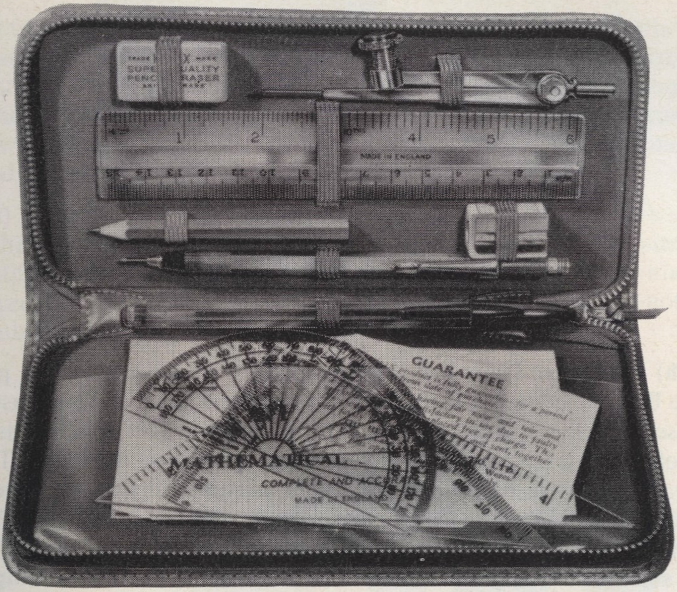
Chemistry Stencils

These are cut-out shapes of the items used in school laboratories. They are of transparent plastic and are in four sizes, the most popular being Nos. 3 and 4.

Geometry or Mathematical Sets

The above items are assembled by the manufacturers into boxes or cases of many types, usually with brand names. These are useful for children, as they make a convenient means of carrying their instruments when they go home, or of carrying them from classroom to classroom.

The box or case was originally metal with hinged lid and, on account of price and strength, this is still perhaps the most popular. Others, made from wood, are usually considered too bulky. There is a growing range of plastic cases which look very attractive and are pleasant to handle. These are made in many colours and designs, and with zip or press-stud fastenings. The standard contents are compasses and dividers, 6 in. rule, 45° and 60° set squares and protractor. Manufacturers now fill out the sets with pencils, erasers, pencil sharpeners, chemistry stencils, etc.


Geometry or Mathematical Set.

These school instruments should not be sold to a student requiring them for technical drawing, as they are considered suitable only for general school work.

3. Drawing Aids

Fixed Angle Set Squares

These are drafting aids used to draw angles. There are two main types, those with fixed angles and those that can be adjusted to various angles.

(a) Sizes and Degrees: The technical student usually requires a pair—*i.e.*, 45° and 60°. In a pair the measurement of the hypotenuse (the edge which is opposite the right angle) is identical in both the 45° and 60°, but the size referred to is the length of the longest of the edges comprising the right angle. Therefore in a 45° set square, both the edges enclosing the right angle measure the same length, but in the 60° they are different, and it is the longest side which is referred to.

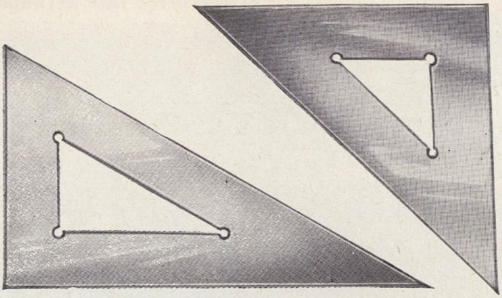
The angles on a 45° set square are 90°, 45° and 45°.

The angles on a 60° set square are 90°, 60° and 30°.

The usual pairings are as follows:—

45°:— 4″ 5″ *6″ 7″ *8″ 10″ 12″
60°:— 5″ 6″ *8″ 9″ *10″ 12″ 14″

Those marked with an asterisk may be taken as the most popular.



Student Type Set Squares.

(b) Qualities: There are several qualities which govern the price. The best are cut from the sheet of transparent plastic. This plastic is loosely referred to as celluloid, but in point of fact celluloid is not so often used to-day as far better plastics are now available. There are several trade names for this better plastic, but they all have the same merits. These materials are very **flexible**—*i.e.*, they will bend and spring back into their original position without breaking. They are **stable**—*i.e.*, they will not shrink or expand in reasonable temperatures and will not warp. They are **non-inflammable**, and are fully **transparent**, either clear or tinted. The old type of celluloid set squares does not have these characteristics.

These better set squares are usually offered in three thicknesses—0·05 in., 0·06 in. and 0·08 in., and can be obtained with plain edges (*i.e.*, square) or bevelled edges for ink drawing. Accuracy is, of course, essential, but in this respect set squares of this quality, when bought from a reputable supplier, can be relied on.

As a cheaper alternative there is now available a variety of injection-moulded set squares. These are not cut from the sheet of plastic, but each is moulded to the required shape. They have several disadvantages when compared with those cut from the sheet; they are not fully flexible and will more easily split or break; the surface is not so hard and in use will scratch and obscure more quickly than with the more expensive ones; there is not the wide selection of sizes and thicknesses (the usual thickness is approximately 0.06 in.).

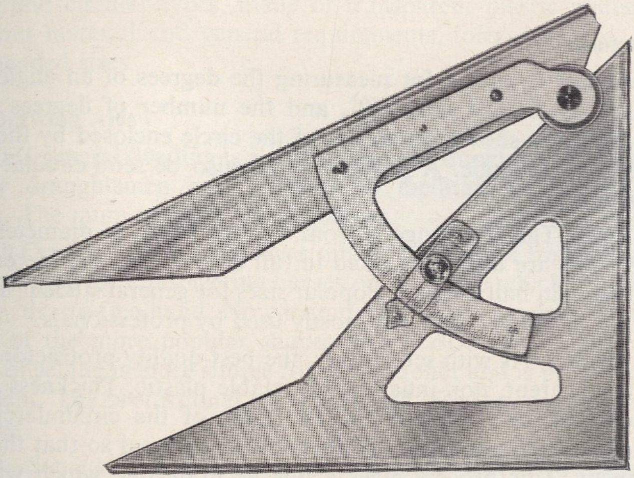
It should be noted that within this range there are varying qualities, and new powders from which they are moulded are continually being devised. The best in this field, up to the moment, is described as acrylic, and this is tougher than the other substances.

(c) Other types: In addition to those made for general use, which are usually without markings, there are other types with various graduations. These are often marked so that the functions of protractor, scale and drafting triangle are combined. Others are designed for rather more specialist use.

Adjustable Set Squares

This type of set square is a very popular instrument with students and is also used by professional draughtsmen. The basis of the adjustable square is a 45° square with the hypotenuse adjustable through a further 45 degrees. By using both edges, angles from 0° to 90° can be drawn without using a protractor. Consequently the instrument speeds up the process of technical drawing.

(a) **Sizes:** When the adjustable set square was invented, the length of the hypotenuse (the adjustable side) was used as the size to identify the instrument, and this is still the size used by most manufacturers. The most popular are 7 in., 10 in., 12 in. and—not so popular—15 in.



Adjustable Set Square.

(b) **Quality:** There is a wide range of qualities and prices, As with the standard set squares referred to in previous paragraphs, so the best-quality adjustables are made from sheet plastics and similar materials. In addition, adjustables cut from perspex are made, and this proves satisfactory in use. Usually the better adjustables are tinted and most users prefer these. There are also other points which identify a better adjustable. The dial on which the degrees are marked is better in white material and the markings should be deeply marked in black. For accuracy the dial should travel through a transparent cursor on which is marked a hair-line. The nut and screw which set the adjustable should be strong and well-finished and quite flush with the back of the instrument. The hinge also should be strong and well-designed. Some of the models which are cut from plastic do not incorporate all these features, and any variation in the price can usually be accounted for by some difference in the features set out above. Adjustables are obtainable with plain (square) or bevelled edges.

In the cheaper-quality adjustables there are several satisfactory types suitable for first-year students. These are usually moulded in clear plastic and do not have the white scale. They can be obtained with square edge or bevelled edge.

British Standard for Set Squares

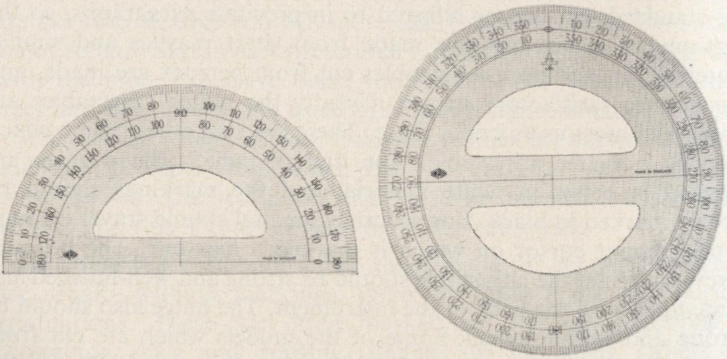
This covers only set squares of the fixed angle (45° and 60°) and adjustable types, made of transparent plastics materials. It sets out material and general requirements, tolerances, etc., and preferred sizes.

Protractors

A protractor is an aid for measuring the degrees of an angle. The full circle is divided into 360°, and the number of degrees in an angle are those shown on an arc of the circle enclosed by the lines comprising the angle. A protractor can also be semi-circular—*i.e.*, comprising 180°.

(**a**) **Sizes**. The size range is from 4 in. to 10 in. in diameter. The smaller sizes are usually marked in full degrees and the larger ones additionally in half degrees. Popular sizes for general student use are 4 in. to 6 in.; larger sizes are mostly used by professionals.

(**b**) **Quality**. As with set squares, the best-quality protractor is cut from transparent, non-inflammable, stable plastic. Thickness varies between 0·05 in. and 0·08 in. The edge of the circumference is bevelled and the markings are chemically engraved so that they are permanent. This process gives a fine accurate line which will not wear off even after years of wear. The surface of the plastic used is hard and will not, therefore, obscure or scratch easily.



Student Type Protractors.

For students' use they are made of moulded plastic. Here the markings are imposed by means of a blocking machine. These are clear initially, but do not wear so well as the chemically-engraved type. And, of course, the plastic will scratch and obscure more readily. Thickness is about 0·06 in.

(c) **Other types:** As with set squares there are other types of protractor with graduations for a particular use. One has a movable arm attached so that the angle can be followed through beyond the protractor edge. There is also a rectangular protractor. This incorporates various scales in addition to degree markings. It is usually made in boxwood or a white opaque plastic.

British Standard: This covers only protractors of the semi-circular and circular types, made of transparent plastic materials. It sets out material and general requirements, tolerances, etc., and recommended sizes.

Other Drawing Aids

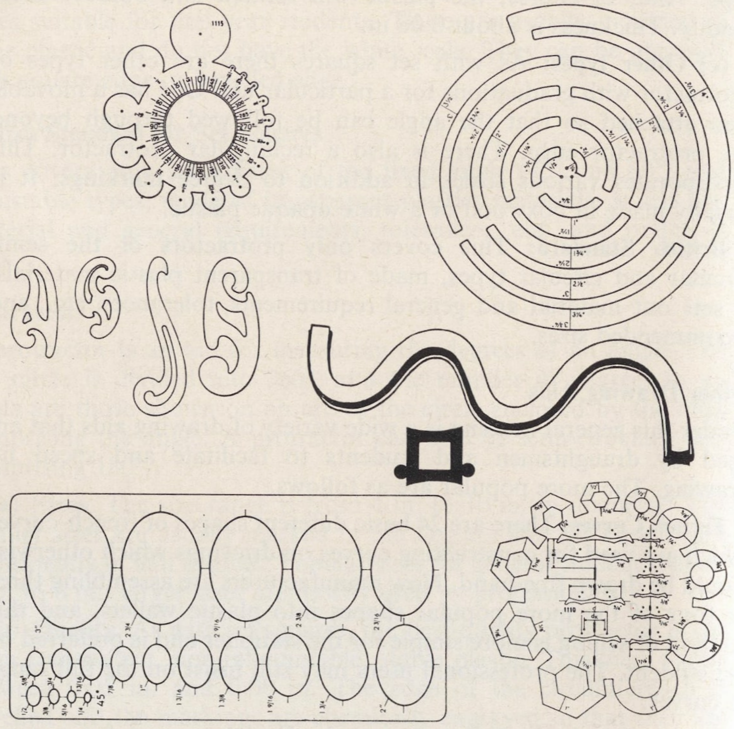
Under this general heading is a wide variety of drawing aids that are used by draughtsmen and students to facilitate and speed up drawing. The more popular are as follows,

French Curves: There are 24 basic different shapes of french curves which are used for constructing curves on drawings which otherwise would be drawn free-hand. Now manufacturers are assembling three or four of the more popular shapes into plastic wallets, and this method of selling is more simple for the stationer and is preferred by the student. The professional users may still insist on the full range of curves.

British Standard: This covers only French curves for general drawing office use, as distinct from other mathematical curves and is made of transparent plastic materials. It sets out material and general requirements, tolerances, etc., and recommends certain conventional shapes and sizes.

Flexible Curves: This is an ingenious device which enables any curve to be constructed. The flexible curve consists of a piece of lead which, of course, can be bent to any shape. On either side of the lead strip is placed a steel strip which ensures that the curve can be bent only in one plane. Then the whole is covered with a plastic cover which often incorporates an ink ruling edge. These can be obtained in lengths of 12, 15, 18, 24 and 36 in., and some firms are able to supply in any length to order. These flexible curves are very popular.

Radius Aids and Curves: These consist of transparent plastic into which are stamped holes of a specified diameter and this is the internal aid. Then there are the circular pieces of plastic from which protrude circles of different diameters which enable circles to be drawn quickly and simply without using a compass. These items, however, would not be used where a high degree of accuracy is required.



Various Drawing Aids.

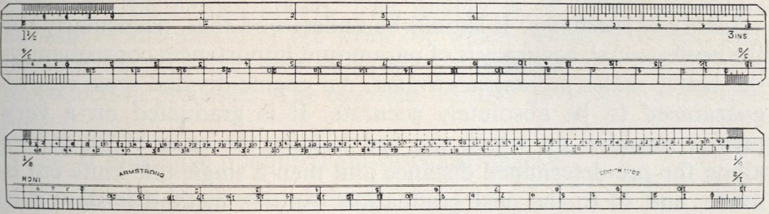
Miscellaneous: There is a great variety of templates, stencils, curves, etc. Mostly made from transparent plastics, they include mathematical curves and shapes (hyperbola, parabola, etc.); fan curves, which are various curves attached at one end so that they open out like a fan; circle, eclipse and hexagon templates; nut and bolt, welding, electrical symbol and flow process templates. These are only a selection of an increasing range. The demand is correspondingly less, the more specialized the item becomes.

Drawing Office Scales and Parallel Rules

Scale Rules: Scale rules perhaps cause more confusion in a stationer's shop than any other single item. First of all, a scale is an instrument used by anyone whose business it is to draw or read designs, plans or maps which are drawn to scale. Obviously, therefore, a wide variety of scales is made. An *engineer* may read a design which is drawn half-size, a *builder* will be reading a plan which is on the scale of one inch to the foot, while the *surveyor* will read a map whose scale may be one inch to the mile. These are the main professions to be kept in mind when thinking of scale rules.

(a) Types

Engineers and Draughtsmen to the engineering profession require the **Armstrong scales**. The Armstrong has eight scales—$\frac{1}{8}$ (each main division is one eighth of an inch and this scale would be used by anyone making a scale drawing on which one eighth of an inch represents one inch), $\frac{1}{4}$, $\frac{1}{2}$, full size, $\frac{3}{8}$, $\frac{3}{4}$, $1\frac{1}{2}$, 3. Now there are sub-divisions of the main division numbering twelve to the inch (or parts of twelve). This Armstrong Scale, which is the most usual, is often spoken of as "Armstrong to 12ths." This is to identify it, as more recently there have been other Armstrong scales made to meet the need of the professions—one which is sub-divided to 8ths (Armstrong to 8ths) and the other which is sub-divided to 10ths (Armstrong to 10ths). Although these two latter scales are gaining in popularity, unless any qualification is made it can safely be assumed that, when an Armstrong scale is asked for, an Armstrong to twelfths is required. The Armstrong scales referred to above are what is known as "*open divided*," which means that only the first main division is sub-divided and the other main divisions are open as shown below:—



Armstrong Scale Rules.

In addition, there is for draughtsmen a *fully-divided scale—i.e.*, the sub-divisions go right through the length of the scale—and this has the scale $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$ and full size. These are sub-divided to twelfths.

Architects or Builders require a rule which gives the scales $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$ and full size, sub-divided to twelfths (being sub-divided to twelfths, the scale represents an eighth of an inch to the inch or the foot) and, for ordnance map reading, 1/500 and 1/2500, which are popular scales for roads and fields.

Ordnance or Surveyors' scales are used by civil engineers and are the scales on which the ordnance maps are based—namely 1/500, 1/2500, 1/1250 and 6 in. to the mile.

Metric Scales: With the gradual changeover to the metric system, there is increasing interest in metric scales. The size will be 150 mm. and 300 mm. (against 6 in. and 12 in.) with markings in various scales and combinations of ratios, etc. In view of this there will undoubtedly be an increased demand for conversion scales, such as 1 in. × 1/10 in. × mm., 1 in. × 1/16 in. × mm., and other scales.

(b) Quality

It is necessary for a scale to have a thin edge to bring the markings close to the paper, and the scales described above are of *oval section* so that both sides of the scales are used in the same way. The cheaper scales are sometimes of a section similar to that of the school rule called *flat section.* All scales are supplied 6 in. and 12 in. long.

There is also a triangular section scale, usually 12 in. size, and this allows six edges for scale markings.

There are several qualities of scales, from the best as used by professionals to the cheapest as used by early-stage students or even school children.

Materials: The best scales are made of boxwood with an inlaid white edge. The lamination of the two materials prevents warping and twisting, and the white edges provide the ideal background for the fine black markings. Next comes boxwood without any laminations, and then either white or yellow plastics.

Quality of markings: It should be understood that, particularly for the professional, accuracy is of paramount importance; consequently, the better scales are *engine-divided.* An engine-divided scale can be guaranteed to be absolutely accurate. It is graduated on a very precise machine on which the bed holding the scale blank moves along the pre-determined distance and then a single fine knife cut is made, and so to the next graduation. As this method is slow it is expensive, but there is no other method of ensuring complete accuracy. The scales that are engine-divided are usually marked stating that this is so, and it is invariably only the boxwood with the inlaid white edge and boxwood that are marked in this way. Plastic scales and the cheapest boxwood scales are marked by a single blow with a tool similar to a printing block and, while the accuracy may be sufficient for young students, it is not possible by this method to guarantee accuracy.

British Standard: This relates to boxwood scales and boxwood scales with celluloid edges, used by architects, engineers and surveyors. It sets out requirements covering materials, sections, sizes, dividings, etc., recommended standard scales and ordering details. In view of the metric conversion the present standard will undoubtedly be revised as soon as possible.

Parallel Rules: As the name indicates, these are a means of drawing parallel lines and are used to a large degree by navigators and surveyors when plotting courses, etc. The most usual type sold by stationers is the bar parallel rule, which consists of two pieces of material, now usually perspex, linked by two brass bars. The distance between the ruling edges can be varied, but they always remain exactly parallel. There are other types such as rolling parallel rules, but these would normally be stocked only by stationers specializing in navigational instruments.

4. Lettering Accessories

Some of the items that will be mentioned in this section will have been dealt with elsewhere in this book. The reason is that the majority of these items are also sold by stationers who do not necessarily sell other drawing materials. However, since they are part of this chapter, they will be repeated here with certain comments.

Pencils

These are of two types:—

(a) Wooden: A first-class drawing pencil is a most important item of the draughtsman's equipment, so much so that draughtsmen usually have very definite preferences as to brand. The degrees are usually from H to 6H, but there is also some demand for the softer and even the harder grades. The quality is of vital importance because of the nature of the work for which pencils are used, and because the drawings are generally reproduced by one of the reproduction processes. The essential features in respect of the lead are:—

(1) It must give opaque (light-resistant) marks;
(2) It must be clean and sharp;
(3) It must be completely erasable;
(4) The grading must be evenly spaced and consistent;
(5) The point must not wear down too quickly, crumble, or break under pressure.

The wood, of course, must whittle easily and cleanly.

(b) Clutch Pencils: Under this heading are also included "drop action" "collet type" and "lead holder" pencils. All these terms apply to pencils which consist of a lead-holder and loose leads. They are very popular as they avoid the necessity for sharpening and thereby save valuable time. The lead is held firmly in the holder by means of a collet or clutch, which is opened by depressing the top of the holder. The lead is then extruded to the required amount. Some holders incorporate a sharpening device for the lead. The lead requirements are exactly the same as for the wooden type. In addition, the holder must:—

(1) Hold the lead firmly and securely;
(2) Be comfortable to hold;
(3) Be well balanced.

Erasers

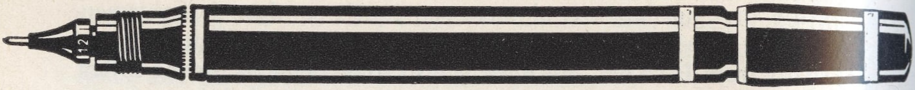
Top-grade erasers are usually required. They must be smooth and effective, and should not smudge or crumble. Generally, rubber erasers are preferred, but plastic erasers are becoming more popular. Where soft leads are used the art gum eraser is called for.

Pens

There are three main types:—

(*a*) *Pen Nibs* are still used, though, of course, not so widely as they used to be. Made to high standard, a range is available covering most drawing office requirements.

(*b*) *Ruling Pens*, too, are not so popular, although here again they are made to exacting standards for a variety of purposes.



Stylographic Type Drawing Pens.

(*c*) *Fountain Drawing Pens* have largely superseded the pen nib and ruling pen. These are made on the stylographic principle with a reservoir to hold the drawing ink. The point units are usually interchangeable and vary in thickness from 0·1 mm. to 1·22 mm. A type is also made for use with stencils. In addition, various attachments are available for compass work etc. These pens are precision instruments, and the user is most demanding in his requirements as to function and quality.

Stencils

In addition to those stencils used as a drawing aid, other stencils comprise complete alphabets, numerals, and other technical symbols to facilitate the lettering on drawings of titles, figures and the like. Many styles and sizes of lettering can be obtained and there are one or two suppliers who specialize in this type of equipment, which is almost an industry in itself. They are made both for pencil and ink work and save an enormous amount of time. Special stencils can be made to the customer's specific requirements. In some cases they are made for use with special pens.

Lettering Accessories.

Drawing Ink

(*a*) The most popular drawing ink is *Indian Ink*, which consists of a suspension of carbon in a suitable aqueous medium. If the carbon were simply ground in water it would rapidly settle. To overcome this, starchy or gelatinous bodies are incorporated which assist the suspension of the carbon and, in addition, a proportion of shellac or other material which has a waterproofing effect is usually present. As the impressions obtained from this ink are extremely durable and waterproof they are employed by engineers, architects and draughtsmen for plans and drawings. Blue prints can be copies of originals made in Indian ink, and it is most suitable for other reproduction processes.

Quality is largely determined by the fineness of division of the carbon. Consequently, special mechanical means of grinding are employed. The more finely the carbon is ground, the more permanent its suspension in the medium will be.

(*b*) *Coloured drawing inks* are used for contrasting purposes in the preparation of maps, drawings, etc. They are usually waterproof and, in place of insoluble carbon, soluble synthetic colours are used either singly or in admixtures according to the shade required. The liquid medium, which imparts final waterproofness, consists of a solution of bleached shellac dissolved in water in the presence of a small quantity of borax, ammonia or other weak alkali. These inks do not possess the same degree of permanence as Indian ink, but they are made as fast as possible.

(*c*) *White drawing ink* more closely resembles Indian ink in that white pigments such as titanium oxide, barium sulphate, chalk, china clay, etc., are used in place of carbon. As these constituents are heavy, it is almost impossible to maintain them in complete suspension. As a result, bottles of this ink almost invariably show the white deposit of pigment quite separate from the liquid medium, and it is necessary to stir or shake the bottle before the contents are used.

(*d*) *British Standard.* The appropriate British Standard on waterproof drawing ink specifies requirements for coloured inks made from water-soluble dyes, and for black carbon inks. It does not apply to pigment inks of any colour, including white, nor does it apply to non-waterproof black inks. The standard colours, designated as B.S.(D1) colours are:—

Violet
Prussian Blue
Cobalt Blue
Light Green
Dark Green
Yellow
Orange
Vermilion
Scarlet
Carmine
Brown
Black

Other British Standard specifications relate to resistance to light, solvent-resisting qualities, draughting qualities, erasure, keeping qualities, container and packing sizes, preparation and methods of testing.

5. Drawing Instruments

The instruments sold by stationers are centred around the following basic items:—

Compass (pedantically this should be referred to as a "pair of compasses" in the same way as a pair of scissors): This is an instrument for drawing circles or parts of circles.

Divider: This is an instrument for transferring distances from a scale to a drawing or vice versa.

Spring Bows: These are instruments for very accurate work on small circles and dividing.

Giant Bows: These are instruments which combine the functions of the spring bow and the ordinary compass.

Pens and pen attachments: These are instruments for inking-in the pencil drawings.

Instrument Sets: These comprise selections of the above instruments.

These instruments are made in a wide variety of design and finish according to the price paid, and the following are the points to be considered:—

Compass

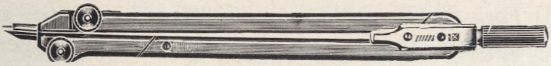
(*a*) *Size:* This will vary from 5 in. to 7 in. according to price and requirement.

(*b*) *Design:* The compass ideally should have a

(i) *Self-centring head.* This means that the little handle by which the compass is held when in use (called the head or bow) is automatically in the right position for use whatever the distance between the legs.

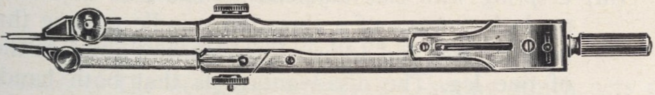
(ii) *Swivel needle-point and knee-joint.* These are methods whereby both the point side and the pencil side can be adjusted to be vertical however wide the compass is opened. This is essential for wider radii.

(iii) *Detachable pencil part.* The compass is made so that the pencil part can be removed and a divider or pen part inserted in its place. Also, when the pencil part is detachable, a lengthening bar can be fitted making much larger work possible.



Compass with Self Centering Head, Swivel Shoulder Needle Point and Knee Joint.

(iv) *Shouldered points* (*or needles*). It is desirable that the point of a compass should be as fine as possible to ensure that the paper is defaced as little as possible where the point enters. Shouldered points are ground to a very fine point with only a slight taper for a short part of its length. All needles should be removable and replaceable.



Compass with Self Centering Head, Swivel Needle Point and Knee Joint, Detachable Points, Shoulder and Needle.

(v) *Movement.* The movement of the compass should be easy yet firm, and provision should be made for adjustment to take any wear at the head.

(vi) *Finish.* This should be good, main parts being brass with polished nickel or chrome-plated. The points should be steel-plated. The top-quality instruments are made of nickel silver or stainless steel.

Divider

(*a*) *Size:* The size usually varies from 5 in. to 7 in.

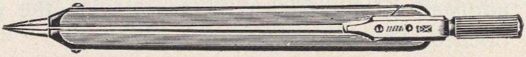
(*b*) *Design:* The refinements mentioned as applying to compasses apply also to dividers in the following respects:—

(i) *Self-centring head.*

(ii) *Shouldered and replaceable needles.*

(iii) *Movement.*

(iv) *Finish.*



Dividers.

Spring Bows

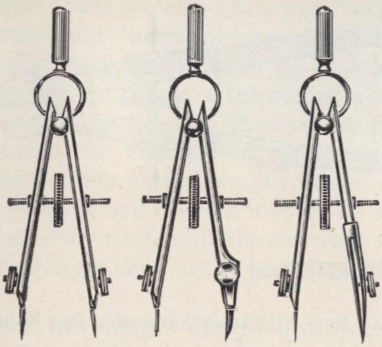
(*a*) *Size:* Sizes vary from 3½ in. to 4½ in.

(*b*) *Design:* The design of spring bows falls into three main categories:—

(i) *Fork-spring steel,* sometimes referred to as English pattern. This type is the best and most expensive. The two legs are made from a single piece of sprung steel and have a centre adjustment. The centre adjustment is a knurled nut in the centre of the two legs which operates the screws adjusting the space between the legs. The centre adjusting screw is preferred because it can be operated with one hand, while the instrument is actually in use.

(ii) *C-spring with centre adjustment.* The C-spring operates on the two separate legs swinging on a pivot. The centre adjustment is as described above.

(iii) *C-spring with side adjustment.* The side adjustment is made by means of a threaded spindle passing through both the legs and adjusted by means of a nut on the side of one leg. The disadvantage is that both hands are required to make the adjustment—one to hold the compass and the other to operate the nut. This type is



C-Spring Centre Screw Spring Bows (Divider, Pencil and Pen).

cheaper than the centre-adjusting one, but it has the advantage that the adjustment mechanism is usually less likely to go wrong.

(iv) *The needles* (*or points*) should be shouldered and replaceable.

(v) *The finish* is usually nickel-plated brass, chromium-plated brass or stainless steel.

(*c*) Under the general description of spring bows are the following instruments:—

(1) *Spring bow pencil.* This has the pencil lead on one side and is for the general drawing of circles.

(2) *Spring bow divider.* This has the two points and is for transferring dimensions.

(3) *Spring bow pen.* This for inking-in drawings.

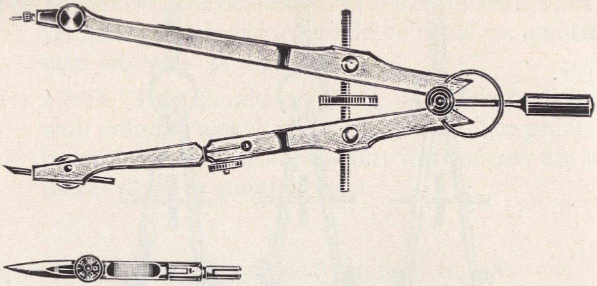
(4) *Spring bow half set.* By means of detachable parts, one instrument can do the job of the pencil, divider and pen.

Giant Bows

The giant bow is an instrument which has gained favour in recent years. It is a versatile instrument which embodies as high a degree of accuracy as the smaller spring bows, and it can also be used for as large circles as the ordinary compass.

(*a*) *Size:* The usual size is 6 in. to 6½ in.

(*b*) *Design:* The design is usually a C-spring which acts on a pivot between the two legs. It has a centre adjustment which is similar to that of the spring bows.



Giant Bow with Interchangeable Pen Point.

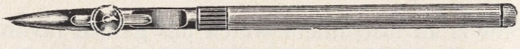
(*c*) Under the general description of giant bows are the following instruments:—

(1) *Giant bow pencil:* This has the pencil lead and is sometimes supplied with a steel needle of the same size as the lead so that it can be fitted in to make a divider.

(2) *Giant bow with detachable pen, pencil and divider parts:* This compass has knee-joints and also a lengthening bar which can be fitted for drawing much larger circles.

Ruling Pens and Pen Attachments

The ruling pens and pen attachments are for inking-in pencil drawings. The quality and price vary considerably according to the temper of the steel and the precision of the grinding of the points. The thickness of the line to be drawn can be regulated by an adjusting nut operating on a screw which pulls the two halves of the nib together. Ink is inserted between the two halves of the nib, and there are various devices whereby the two halves can be separated for easy filling and cleaning. The pens are usually fitted with bone or ebony handles, and the pen attachments for the compasses are made so that they can be fitted into handles to make a spare pen.



Ruling Pen.

Special Purpose Instruments

In addition to the instruments already described, there are others which are designed for a rather more specialized use in the drawing office. The demand however is rather less than for the general types of instrument.

Pump Compasses: These are also known as "rotating compasses," "pump spring bows" and "drop compasses with twirler." They are designed for drawing very small circles up to $\frac{1}{2}$ in. radius. A steel plunger passes through the centre of the compass on which the body can be raised or lowered. A knurled sleeve on the body of the instrument is held between the fingers, the index finger depressing the plunger. The point is then accurately positioned on the paper and the pen or pencil point is well raised above it. To describe the circle, the knurled sleeve is lowered until the drawing point touches the paper, the central plunger kept steady and the instrument is rotated around it.

There are several advantages of this instrument. On ink work, the pen is kept well away from the paper until the point is correctly positioned. There is an unobstructed view of the centre point and the critical setting required for drawing small circles is obviated. Also the double spring assembly allows the drawing point to remain parallel to the axis of the instrument for any radius which has been set.

Beam Compasses: For drawing larger circles than are possible with conventional compasses, beam compasses are used. They consist of a lath along which move two heads, each with facilities for holding points, pencil or pen-attachments as required. These heads are moved along the lath by hand, being secured at the correct setting by knurled screws, or moved by roller action, the fastening being made by snap springs. Most beam compasses have additional sections which can be attached to each other to achieve greater radii, up to about 60–70 in. if required. The laths are made in flat section in wood or light alloy and in triangular and tubular form.

Pantographs: These provide a mechanical means of reducing or enlarging drawings by passing the tracing point of the instrument over the lines of the original. The pencil point will automatically reproduce the original in reduced or enlarged scale, according to the ratio at which the instrument has been set.

The bars of the pantograph can be of square section tubular brass, with a heavy brass fulcrum, having short projecting pins in its base to keep the instrument steady when in use. The arms bear the various calibrations for reducing or enlarging in numerous ratios as required. A more simple form of pantograph is made of boxwood, which is extremely light and very moderate in price, having an iron fulcrum for securing to a drawing board, but the range of calibrations is rather limited compared to the brass variety. Brass pantographs are available in 24 in., 30 in., 36 in., 42 in., and 48 in. sizes and the boxwood type in 18 in. and 24 in. sizes.

Proportional Dividers: These are instruments used for obtaining proportional divisions in line or linear ratio form (*e.g.*, 1:3, 2:5, etc.)

or subdividing circle circumferences. They are also used for enlarging and reducing of areas on plan drawings, and of volumes on drawings of solids. All these are obtained by individually calibrated scales on the instrument. The dividers have two legs, each having a long point at one end, and a short point at the other, the points being either straight or hook-type. The centre section of each leg is flat, having a cut-out channel down the length, and a knurled screw through the channels holds the legs together. A pivot, bearing an engraved settling line, is connected to the screw. The calibrations are marked on each side of the top leg. In use, the screw is loosened, the setting mark on the pivot correctly aligned to the required calibration, and the screw then retightened. Proportional dividers are usually made of Electrum or carbon steel with stainless steel points, and are available in 6 in., 9 in. and 12 in. sizes.

Instrument Sets

The basic instruments having been described, the manner in which they are sold will now be considered.

(1) The instruments can be sold loose as individual instruments. They are offered by the manufacturer or importer in various forms of packages. The most popular is the limp plastic wallet which keeps the instruments free from dust and protects the points. Most of the wallets have clear fronts so that the instruments can be seen without removing them from the wallet.

(2) The instruments can be assembled into sets or boxes of various types with a wide variety of different assortments.

  (*a*) *Boxes:* Traditionally, the box is what is described as the barlock case, which is a hinged wood case covered with leatherette or paper. The inside is shaped to take the instruments and is lined with velvet or velveteen. The fastening from which the case gets its name is by means of a bar or wire which travels in a groove in the bottom of the case and engages with a loop in the lid. It is a neat form of fastening but it is often stiff and awkward to operate. Of recent years other types of boxes have been developed, but the barlock is still the most popular. Other types include the zip-case, which retains the velvet-lined wooden base, but this is covered with a limp plastic outer with a zip-fastener round the edge. This is not very popular owing to the suspicion that the zip may give trouble. Then there are rigid plastic cases which hold the instruments in flock-lined plastic divisions and are fastened by means of magnetic pads or ingenious catches.

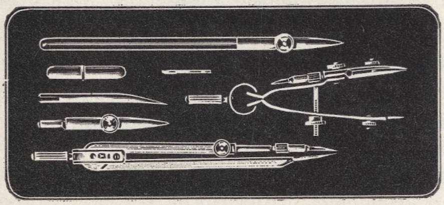
Both the latter are effective means of holding the instruments, but are not as yet generally accepted.

(*b*) *Contents:* As mentioned above, there is a wide assortment of contents. It is quite impossible to list all the types.

The full set consists of compass with attachments, divider, two ruling pens, three spring bows, screw driver, spare leads and sometimes a tube containing spare needles and screws.

The half set comprises a compass with detachable pencil, pen and divider parts and a lengthening bar. This is popular as a "loose" instrument in a plastic wallet, as well as in a case.

Other sets are assembled with one or two spring bows, and the ordinary divider is often omitted.

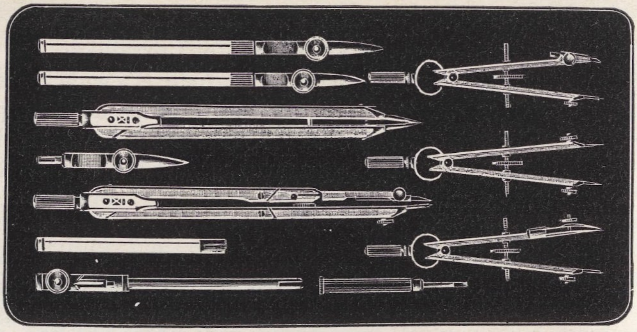


Student Type Instrument Set.

Giant bow sets, of course, include the giant bow compass, and the most popular set consists of the giant bow compass, detachable pen, pencil and divider parts with lengthening bar.

As pens are now used less and less by students, sets are made up without any pens, and a popular set consists of compass with divider attachment and lengthening bar, and spring bow pencil.

(*c*) *Qualities:* As previously mentioned, there is a wide variety of qualities and prices, and most stationers stock the cheaper varieties for the elementary student as well as the better qualities for the more advanced student and the professional. When instruments are offered by an established firm manufacturing or importing instruments, there is always a good reason for differences in price, and from what has been said it will be possible to see how any economies can be effected. Instruments are made in England and they are also imported from Western Germany, Czechoslovakia and Switzerland and, to a lesser degree, from France and other European countries.



Professional Type Instrument Set.

British Standard

This sets out specifications for materials, manufacture and sizes of instruments for drawing office use and includes certain definitions. Since the requirement of the specialist user varies considerably, and the range of available items is so wide, for the purpose of this chapter it is not considered practical to include details.

6. Slide-Rules and Calculators

Uses

The slide-rule was conceived some 200 years ago. In the long period during which it has been put to practical use it has been developed into a perfect instrument, which provides its owner with a rapid and accurate answer to almost any mathematical problem. In all technical occupations the slide-rule has, therefore, become indispensable, and in the last twenty years or so its uses have spread to commercial spheres. It can render equally valuable service to those engaged in a number of other professions, where practitioners are similarly aware of the advantages which it offers.

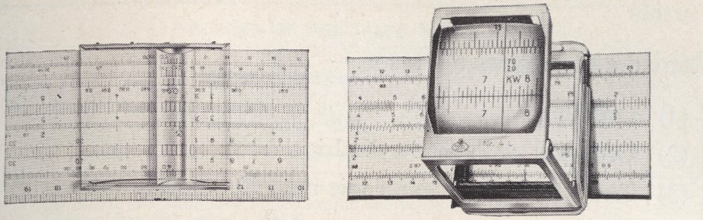
The slide-rule is made up of three main parts:—

(a) Stock (base),
(b) Slide,
(c) Cursor,

each having graduations which enable various calculations to be made such as multiplication, division, subtraction, square roots, cube roots, tangents, logarithms, etc.

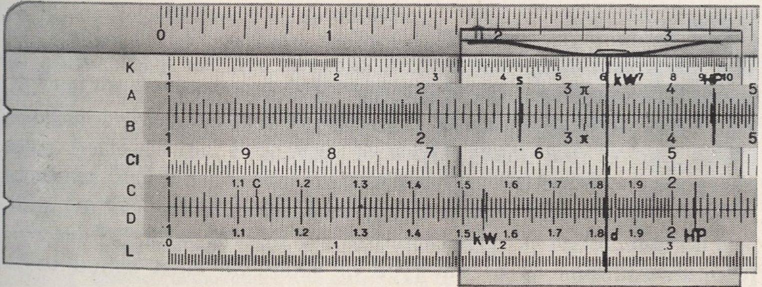
Materials and Care

Slide-rules of specialized wood construction (*i.e.*, laminated or bamboo) are generally impervious to climate but they should,



Semi-Cylindrical and Telescopic Magnifying Cursors.

nevertheless, be protected from any considerable temperature fluctuations and from humidity. The resilient base gives the slide-rule great elasticity, making it easier to move the slide and to adjust its mobility. There are metal inserts ensuring exceptional stability in the basic structure of the slide-rule and preventing deformation by climatic influences. The majority of slide-rules of plastic material are "climate-proof" as well as heat-proof and damp-proof, and they stand up to the effects of the majority of chemicals. Plastic rules should not, however, be allowed to come in contact with corrosive liquids or strong solvents, as these—even if the material itself remains unaffected—are at any rate liable to cause the colour of the graduation marks to deteriorate. To preserve the legibility of the graduation on any slide-rule facial scales, the cursor should be protected from dust and scratches and cleaned at frequent intervals with the special agents which are available. They should never be cleaned with alcohol.



Students "Reitz" Slide Rule.

Sizes

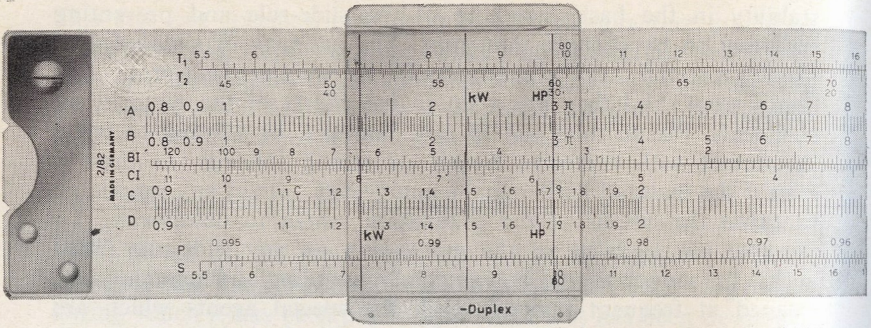
The majority of slide-rules are made in 5, 10 and 20 in. scale lengths—5 in. models for the pocket, 10 and 20 in. models for the desk. Cases for the rules are generally made of cardboard, plastic or leather.

Cursors

There are three types of cursor:—

(1) Ordinary;
(2) Ordinary, with semi-cylindrical lens;
(3) Those fitted with telescopic magnifying lens.

The last-mentioned offers greater accuracy when taking readings. Cursors have lines of equal or unequal constants which enable easy calculations to be made, such as changing watts into H.P., or ascertaining the area of a circular cross-section from a given diameter or the volume of a cylinder.



Professional "Duplex" or Double Sided Slide Rule.

Types

The particular slide-rule system depends on the profession; for example, an engineer would use the "Rietz" or preferably, the "log log" rule, whereas a person engaged on aerodynamics could best utilize one of the many types of advanced double-faced rules. Everyone is catered for—the student, no matter what he is studying, right through to the advanced physicist. Most of the leading slide-rule manufacturers provide literature of a helpful nature which gives recommendations as to the type of slide-rule most suited to an industry or profession.

Scales

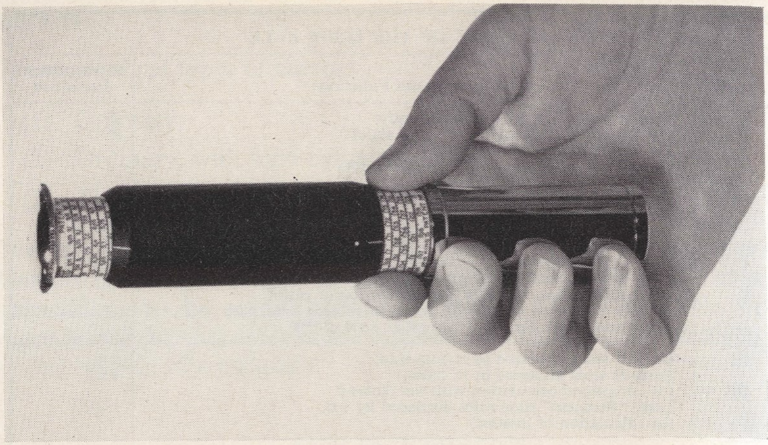
According to the type of slide-rule required and the use to which it will be put, so the scales will vary. The majority of scales in use are standard, and a list follows, giving the names of the scales and the calculations that each can produce.

SCALES OF THE SLIDE RULE

Scales	Definitions and Functions	Mathematical Formulae
A B	**Quadratic scale, fixed** (on upper body) **Quadratic scale, movable** (on upper slide) for multiplication and division, for calculation of squares and square roots	x^2 x^2
BI	**Reciprocal quadratic scale to B**, movable (on centre of slide) for simple and compound multiplication and division, in connexion with scales A and B	$\frac{100}{x^2}$
C D	**Basic scale, movable** (on lower slide) **Basic scale, fixed** (on lower body) for multiplication, division and calculation of ratio; on 2/83 additional C scale on centre of reverse slide, with correction marks for 7th exponential scale $e^{0{\cdot}001}x$	x x
CF DF	**Basic C scale displaced by** π, movable; **Basic D scale displaced by** π, fixed; for compound calculation with the factor π (with "Business" slide rules displaced by 3·6, for calculation of interest)	πx πx $3{\cdot}6\,x$
CI	**Reciprocal basic scale to C**, movable (on centre of slide) for simple and compound multiplication and division in conjunction with scales C and D with "Business" slide rules for calculations of interest and exchange	$\frac{1}{x}$
CIF	**Reciprocal basic scale to CF**, movable (on centre of slide) for compound calculation with the scales CF and DF	$\frac{1}{\pi x}$
K K′	**Cube scale, fixed** (on body of rule) **Cube scale, movable** (on upper slide) for calculation of cubes and cube roots	x^3 x^3
L	**Logarithmic scale** for calculation of mantissae and antilogarithms	$\lg x$
LL_1 LL_2 LL_3	**Exponential scales** for positive exponents, for calculation of exponential functions with positive exponents and natural logarithms from 1·0095 to 60·000	$e^{0{\cdot}01x}$ $e^{0{\cdot}1x}$ e^{x}
LL_{01} LL_{02} LL_{03}	**Exponential scales** for negative exponents, for calculation of exponential functions with negative exponents and natural logarithms from 0·00002 to 0·9905	$e^{-0{\cdot}01x}$ $e^{-0{\cdot}1x}$ e^{-x}
P	**Pythagorean scale** for solving of formula $\gamma = \sqrt{1-x^2}$ in conjunction with the C and D scales, for vectorial calculations	$\sqrt{1-(0{\cdot}1x)^2}$
S	**Sine scale for trigonometrical calculations**	$\sphericalangle \sin 0{\cdot}1\,x$
ST	**Sine-tangent scale** for small angles for trigonometrical calculations	$\sphericalangle \mathrm{arc}\ 0{\cdot}01\,x$
T_1	**Tangent scale** from 5·5° to 45°	$\sphericalangle \tan 0{\cdot}1\,x$
T_2	**Tangent scale** from 45° to 84·5°	$\sphericalangle \tan x$
W_1 W_1' W_2 W_2'	**Square root scales** from 1 to 3·16 **Square root scales** from 3·16 to 10 for multiplication, division and formation of ratios with increased accuracy; in conjunction with scales C and D for calculation of squares and square roots.	$\sqrt{x}$ $\sqrt{10\,x}$
£	**£ scale** for conversion of s and d in decimals of £	

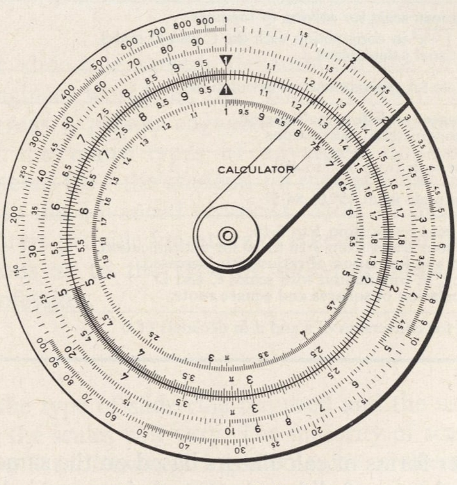
Calculators

There are other forms of calculators based on the same log principle as the standard type of slide-rule, but their range is limited, and it



Cylindrical Type Calculator (66 in. scale).

is a matter for the purchaser to assess the advantages and disadvantages when related to his own profession. The cylindrical form of calculator is constructed principally of metal and, as such, is solid and reliable. Greater accuracy is possible on this form of calculator in that, since the scales are graduated in spiral form, the overall scale length is considerably greater than on the flat form of slide-rule where scales are directly opposed. Finally, there is the circular or disc calculator, usually about 5 in. in diameter, which, although it is identical in principle and has much the same accuracy as the standard slide-rule, has the advantage that it can be slipped



Circular Type Calculator.

into the user's pocket. All the scales are counter-rotating, and a range of models is available which covers the requirements of all major industries and professions.

7. Drawing Papers, etc.

The various types of drafting materials used in drawing offices can be classified in five groups, each of which is dealt with separately. It must be understood that present-day techniques are concerned with the direct drawing on to translucent media so that photocopies made by the diazo process can be produced without any such intermediate stage as tracing.

Tracing Papers

These materials, although described as tracing papers, are normally used for the direct drafting of plans, drawings, maps, etc., rather than for tracing as their name might indicate. This class of material is better described as translucent drawing papers. These materials being translucent, provide an immediate means of producing copies by such as the diazo process.

(*a*) *Natural Tracing Papers* are made transparent during manufacture and are not subsequently treated in any way. They have good properties of light transmission, good durability and high erasure qualities.

(*b*) *Prepared Tracing Papers* are "transparentized" by impregnating the base paper with synthetic oils and resins. Both rag and wood pulp base papers are available in this range in various substances.

(*c*) *Detail Paper* is a semi-transparent paper which is untreated but sufficiently translucent for the production of diazo prints.

Natural, Prepared and Detail papers are available in a choice of surfaces, matt and smooth and they are supplied in various substances.

Drafting Films

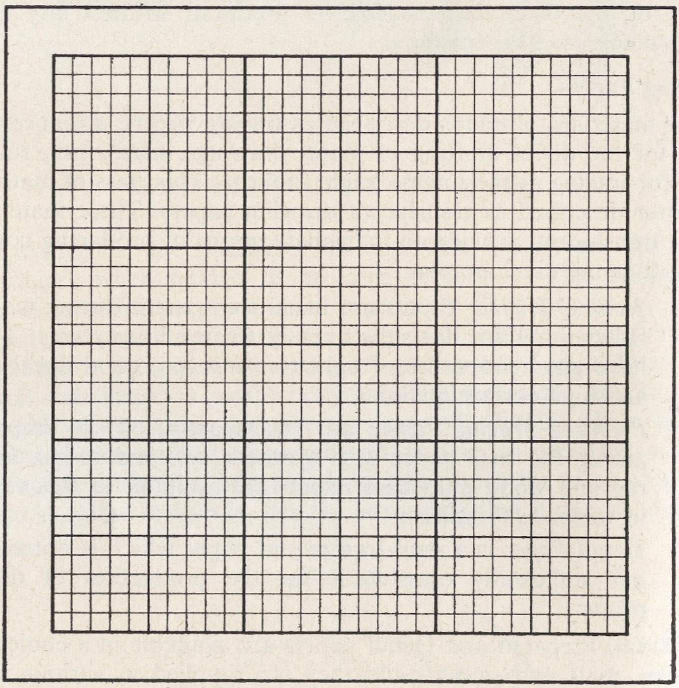
The most popular type of drafting film is that on a polyester base (polyethylene terephthalate). The surface is prepared either by coating or chemically finishing to accept ink or pencil work. The great advantage of these materials is their remarkable strength and scale retention which is of considerable importance when accurate drawings are required.

Tracing Cloth

Tracing cloth is made from long-staple cotton woven and filled to provide translucency and a drafting surface. The material described as tracing cloth is prepared for ink work but there are other qualities with a modified drawing surface suitable for use with pencil.

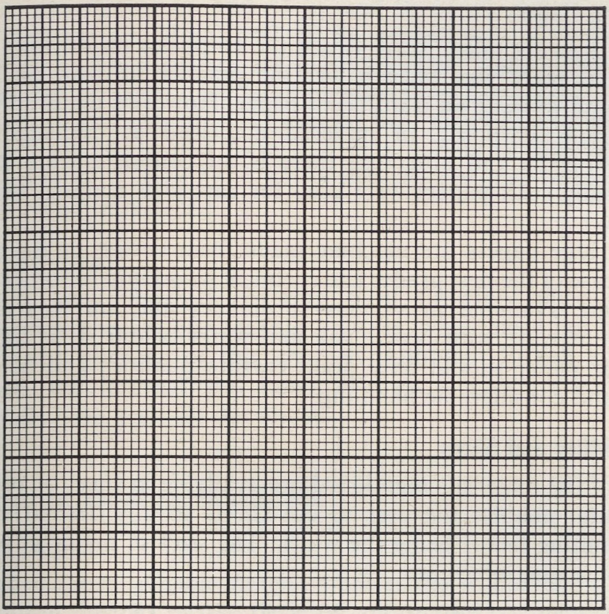
Sectional Papers

Sectional papers, sometimes described as graph papers, are supplied printed with a grid in inch, metric or other units. Apart from their use in the production of design and working drawings, they are used for graphs, mathematical curves, progress and planning charts, etc.



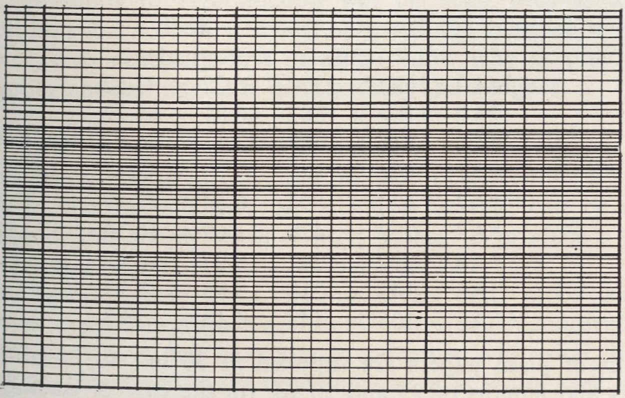
$\frac{1}{10}$ in., $\frac{1}{2}$ in. and 1 in. Graph.

In addition to sectional graph paper there are also ranges of logarithmic and other specially scaled papers, the use of which is increasing in industrial, technological and commercial fields. In most cases the user will know which scale is best suited to the problem in hand, but comprehensive catalogues are available to which reference can be made. Where the user's requirements cannot be met by a standard product, manufacturers are always prepared to print and supply to special order. The minimum economic quantity is usually 500 sheets but smaller quantities in certain circumstances are considered.



M/M ½ & 1 cm Graph.

Most sectional materials are available in drawing, detail and tracing papers and tracing cloth. Cream wove papers are also available but usually for scholastic use. The scaling is usually printed in green, sepia, grey, or blue. In some instances there are plain margins or borders, surrounding the scaling.



Example of Logarithmic Graph (Log 6 Cycle × $\frac{1}{10}$ in., ½ in. and 1 in.).

Drawing Papers

In the drawing office, there is not the emphasis on drawing papers today, as there was when it was the practice to draw on opaque paper and to trace on translucent paper. However, use is still made, for certain purposes, of material described as cartridge paper. For scholastic and other use there is, of course, a wide demand. (Originally such papers were used for cartridge making, hence the name.)

Cartridge papers are machine made from cotton or linen fibres in the case of the best grades and chemical woodpulp for other grades. They are available in various substances and surfaces and are suitable for use with pencil, ink and water colour. It is important that the paper should have good erasure qualities and be able to withstand considerable handling.

Availability and Sizes

Most of the materials mentioned are available in sheet or roll form. The latter enables the user to cut sheets to any desired size, the only limiting factor being the width. The sizes of major importance to the drawing office are :—

40 × 72
40 × 60
30 × 53
30 × 40
20 × 30
15 × 20
10 × 15
8 × 13
8 × 10

Still used and made by some people is 27 × 40 (Double Elephant), but British Standards recommend the use of 30 × 40. Likewise 22 × 30 (Imperial) is still in some demand particularly for scholastic use.

However, the current trend is towards the use of the International "A" series of sizes and these are listed below and those asterisked are considered adequate for most purposes:—

	mm.	Inch equivalent
4A0	1682 × 2378	66.22 × 93.62
2A0	1189 × 1682	46.81 × 66.22
*A0	841 × 1189	33.11 × 46.81
*A1	594 × 841	23.39 × 33.11
*A2	420 × 594	16.54 × 23.39
*A3	297 × 420	11.69 × 16.54
*A4	210 × 297	8.27 × 11.69
A5	148 × 210	5.83 × 8.27
A6	105 × 148	4.13 × 5.83

Rolls of plain papers are supplied in 30 in., 40 in. and 60 in. widths and lengths of 25 and 50 yd. (in the case of tracing papers this is sometimes 20 and 50 yd.). Most Sectional papers in roll form are usually 26½ in. and 41 in. and in 10 yd. rolls. The scale width, however, is 24 in. and 40 in. respectively. Certain more specialized sectional papers are made in other widths, the details of which can be ascertained from manufacturer catalogues.

For scholastic and general purpose use, many of the materials are also available in pad form and in a variety of sizes up to a maximum of 20 × 30 or 22 × 30. As with sheet papers, International sizes are being introduced.

British Standards

Standards are published covering most drawing office papers. The specifications are of a technical nature, which need not be dealt with for the purpose of this chapter. Although British sizes are still used, the International range of sizes is now recommended and details have been set out above.

8. Graphic Design Materials

Graphic Design

In simplest terms, *graphic design* embraces the whole field of visual presentation created by the designer and/or the commercial artist to express as precisely as possible an intention or meaning.

One has only to consider the fantastic growth of publicity and advertising (including packaging, promotional and point-of-sale material), and then add to these the new demands on graphic design made by the new techniques in visual aids (overhead projectors, programmed learning, etc.), plus television, to accept the width and scope of graphic design and the materials used in this field.

Reproduction techniques and materials are widely used in graphic design. Methods of reproduction will be dealt with in another chapter; here it is necessary to deal only with the materials available. However, it is necessary first of all to know why graphic design is so important and how it is dealt with by the designer.

The Designer

The designer's task is to solve the problem of presenting a subject, usually in such a way that the intended message can be readily understood. Put simply another way, he has to produce *a picture conveying desired information easy to assimilate.*

The "picture" may be accompanied by text, more generally known as copy. The graphic designer is not so much concerned with what the copy says, but he is vitally concerned with what the copy looks like. This involves the type and size of lettering used, as well as the shape of the text matter.

The problem facing the designer is the same whether he is involved in just a picture (*e.g.*, international road signs) or a picture with a story (*e.g.*, production of a book jacket). He has to project a visual message.

To enable him to do this, he has to have ready access to a range of specialized graphic materials. These are those beyond the accepted tools of his profession (paper, pencils, chalk, crayons, knives, etc.).

Graphic Materials

Under this heading, consideration is being given mainly to those products and techniques made available relatively recently with the objective of saving the designer time and energy by replacing methods now largely out of date. They are as follows:—

Design Surfaces

A design must be put down on a surface. The most universally used surface is, of course, white drawing paper or board, ideal for black and white presentation. However, where background or other colour combinations are required there are now available materials designed to remove the necessity for colour-washing.

(*a*) *Designers' Papers and Boards.*

These cover a very wide field and include papers of varying quality, pulp, paste, fashion and scraper boards, etc. Some have a plastic coated surface specially keyed to accept inks, water colours, crayon or charcoal, as well as most other graphic media. Since this type of surface will not chip or crack when cut or creased it is ideal for new packaging design.

(*b*) *Plastic*

Designs often need to be produced on completely transparent surfaces. This is particularly necessary for colour separation and overlay work.

Once again, a crystal clear design surface is now available treated on both sides to accept inks, liquid and paste drawing materials, charting and border tapes, transfer lettering, etc. The surface is not suitable for pencil. However, a semi-clear film is available on which pencil can be used.

Designers' Graphics

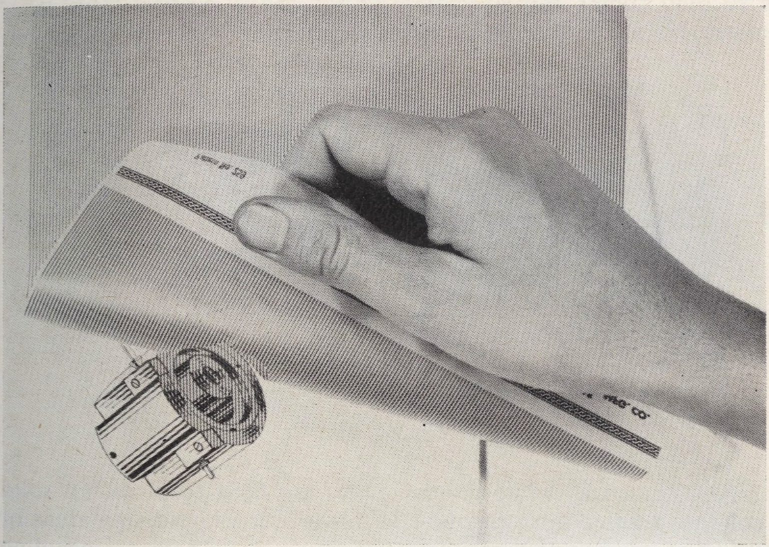
This term is used to describe a comprehensive range of tones and tints employed to produce a general overall effect in the production of the "picture" or *Art-Work*, which is the more acceptable and widely used term.

(*a*) *Graphic Tones*

These are available in a very large number of different patterns including screens (variegated dots), as well as architectural, geological, cartographical, agricultural, etc., designs.

The patterns or designs are printed on a very thin plastic sheeting coated with gentle adhesive. The designer may move it at will until it is finally burnished down in the required position.

These products are now generally heat-resistant to withstand most processes of reproduction, and are available printed black or white.



Graphic Tone.

The *white* screens are often used to break up solid colour, particularly black, to produce an effect of less density. For this reason, graphic tones are sometimes referred to as *Shading Media.* Solid colours need to be so treated sometimes to prevent the eye being distracted from other sections making up the overall design.

This range should not be confused with another, similar in appearance:—

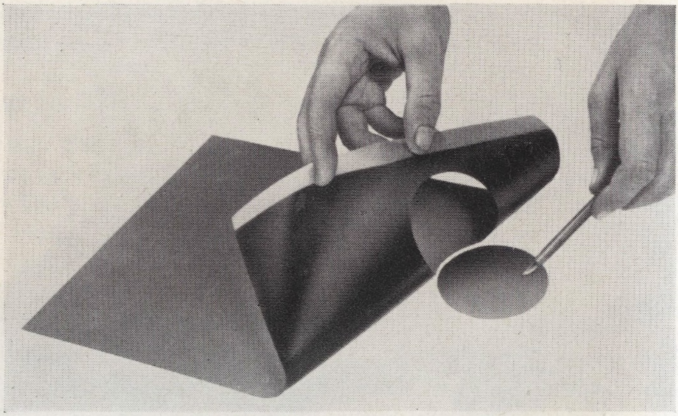
(*b*) *Rub-Down or Dry Transfer Graphic Tones*

These sheets differ from those described above in that they can be used by the designer to transfer the pattern directly on to the design surface with the use of a spatula or burnishing tool. This gives good shadow or cross-hatching results in those circumstances where absolute accuracy or pattern definition is not required.

(*c*) *Graphic Tints*

These are similar in most aspects to graphic tones, and comprise the same type of thin sheets treated with gentle adhesive. But, instead of patterns, there is a range of something like 80 colours and tints available with either glossy or matt finishes. By laying one or more colour/tint over another, it is, of course, possible to produce an endless variety of effects greatly beyond the basic 80 varieties available.

The use of the glossy surface imparts a varnished effect to "*mock-ups*" of, for example, package designs.



Graphic Tint.

Also, much as white graphic tones are used to break up solid colours, graphic tints may be laid down over white design areas or transfer lettering to produce colour or multi-colour, including reversed-out effects.

(*d*) *Rub-Down or Dry Transfer Colours*

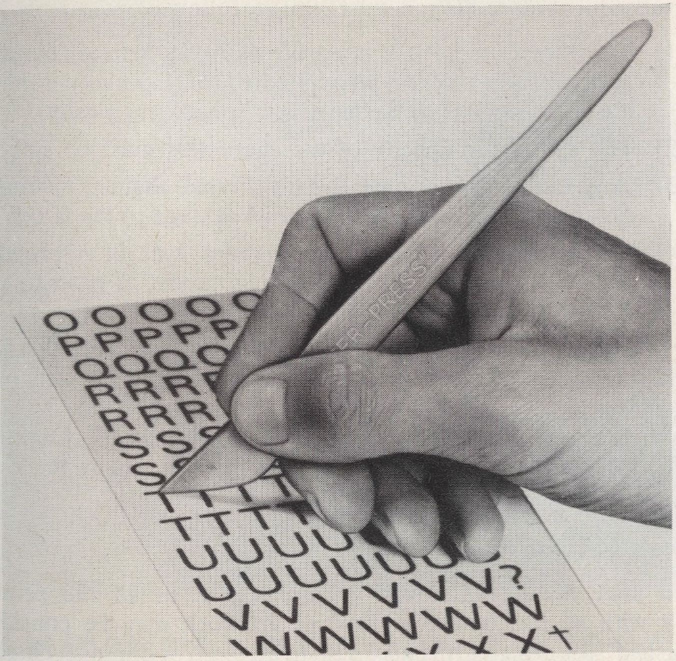
Here again, there are also available sheets of colours/tints which may be directly transferred to the design surface by use of a spatula or burning tool, but the effect produced is not usually so consistent or easily controllable. Naturally, this can be an advantage, depending purely on the result that the designer desires to achieve.

Transfer Lettering

Some background knowledge is necessary under this heading, since it covers the whole field of production of text matter from the designer's point of view. It has already been stated that he is not so much concerned with what is actually said in text form as with the shape and style of the text matter as an integral part of the whole design.

The right type-face must be selected not only to conform with current trends or fashion and the design itself, but also to be in accurate and dimensional relationship. This used to be achieved by a printer setting up and printing the required text. This was then cut up and pasted down to complete the art-work—an extremely difficult and time-consuming process often further aggravated by the necessity to repeat it several times over before achievement of the desired effect.

Basically speaking, the dry transfer lettering systems consist of translucent carrier sheets of letters, symbols, etc., printed on the underside. A backing sheet is most normally provided to prevent accidental transfer either during storage or use. Guide lines or a control grid system allow for accurate alignment of the characters.



Transfer Lettering.

Having selected (even by easy trial and error, as necessary), the desired size and type-face, the designer can locate the letters or characters precisely, the rest of the design being plainly visible through the carrier sheet. It can then be finally placed in position with the use of a spatula or burnishing tool. This causes the letter to become detached from the carrier sheet and to adhere to the design surface. Such care is exercised in the manufacture that the definition of the characters is clean, and problems arising out of hair-line cracks and rupturing have been overcome. In addition most systems are dyeline-resistant.

Although there are many type-faces which remain standard or traditional in character and therefore in constant demand, the dictates of fashion result in the continuous introduction of new and different styles as well as the discontinuation of others. Overall, black remains the most popular, but most systems are also available in a restricted range of the prime colours as well as white.

Additionally, a restricted range of fluorescent transfer lettering is available in a few colours only. This is particularly in demand for use in exhibitions and display work calling for special effects. Certain characters and symbols, including numerals, are available in reel form.

To sum up under this important heading, adhesive lettering used for subsequent reproduction must fulfil the following requirements:—

(1) The transferred letter must be sharp in outline, remaining undistorted with clean unserrated edges (especially important if the art-work is to be "enlarged" photographically).

(2) The density or opacity of the characters must be sufficient.

(3) Any residue left around the transferred character should be capable of being removed without damage to the letter.

(4) The transferred lettering must resist heat in a projection system as well as the heat and curvature of passage when subjected to the dyeline or similar processes.

As well as the very wide commercial range of type-faces and symbols available as standard, the system lends itself well to the production of special printings to customer specification.

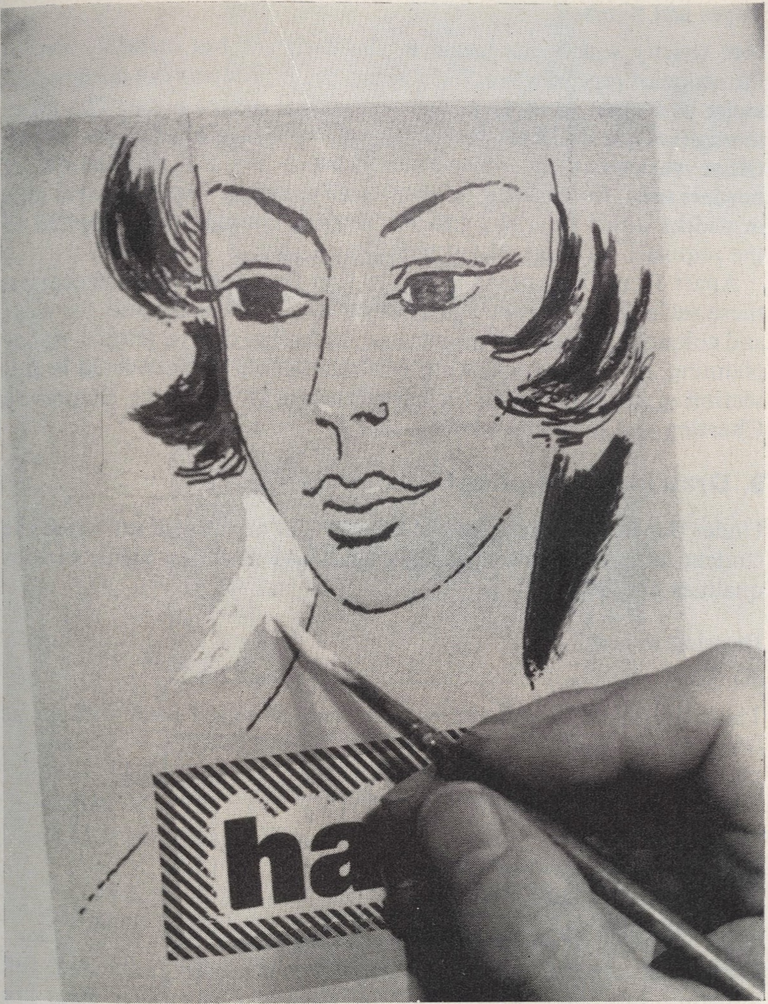
Transfer lettering is also produced in smaller sheets catering for specialized needs and applications, not necessarily in the design field (for use of students, offices, etc.).

Process and Retouching Media

Even after having employed a combination of all the products dealt with so far, before a piece of art-work may be considered "finished" the design artist may wish to increase or diminish emphasis of some portion of the whole. This is known as "re-touching" to produce "highlighting" on the one hand, or to erase on the other. Such effects are produced by the use of brilliant white, grey or black process colours or pastes which must be very opaque, but of a consistency which will permit their use in an air brush.

Similar products known as "negative opaques" are available to produce the same effects in the treatment of photographic negatives.

Process whites are such that they can be drawn upon with ink or other liquids without risk of "feathering."



Work of the Designer.

Full use has been made by the Graphic Designer of the most up-to-date materials and techniques. Conventionally, the Designer would first have drawn the face and then inserted the Tone. This would have meant very careful cutting round the outline of the face and removing the Tone at certain points. Instead of this, the Designer put down a square of Tone (ready printed on a thin plastic material with a burnish-type of adhesive on the underside) and drew the face on top of the Tone. This is possible because the Tone also is a matt drawing surface. Having drawn the face in black, the Designer is now in the process of applying white rather than cutting the Tone away.

The text is produced with dry-transfer which was overlaid with a straight-hatching pattern made from the same material as the Tone. The straight-hatching pattern (as well as the Tone) are top-printed on the plastic; consequently, to expose the lettering, the Designer simply scrapes it away with a blade.

Tapes and Symbols

Not strictly within the scope of the designer, but certainly within the scope of reproduction techniques, these products are designed to assist in a great number of forms of visual presentation. The tapes themselves are available in a variety of colours, plain and patterned. Other variations include special designs for the production of borders used, for example, in display advertising. Tapes are available in widths down to $\frac{1}{64}$ in., and are flexible enough to be applied to the required surface without wrinkling.

Apart from their obvious application in reproduction processes, these self-adhesive tapes and symbols are in wide demand for clear and colourful graphic representation, including charts, graphs, policy planning, etc. This is, however, too wide a field to be covered in this section of the Handbook; further reference is made in the chapter on Charting and Planning Systems.

9. Drawing Equipment

Under this heading are grouped the items of equipment on which the student or draughtsman prepares his drawings. Once again various qualities are involved.

Drawing Boards

(a) Sizes

These are made to suit the various sizes of paper used and are as follows:—

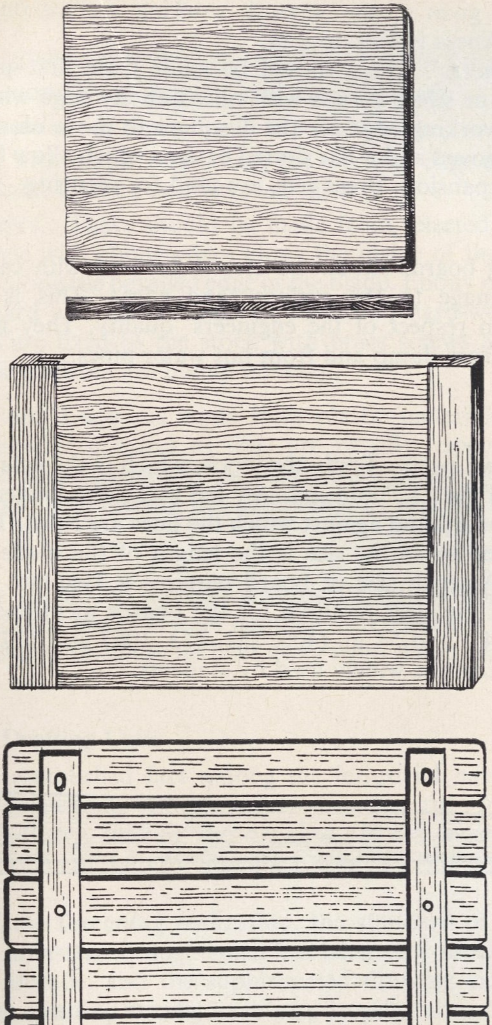
	in.	mm.
*Quarter imperial	16 × 11½	(406 × 292)
*Half imperial	23 × 16	(584 × 406)
*Full imperial	32 × 23	(813 × 584)
Double elephant	42 × 32	(1067 × 813)
Antiquarian	54 × 32	(1372 × 813)

The items marked with an asterisk—particularly half and full imperial—are more widely used by students. The other sizes are chiefly used by the professional.

(b) Qualities

(i) *Plywood:* This is the cheapest board, but is considered satisfactory for students. The surfaces should be free from defects. The edges are painted yellow. Thickness is about ½ in.

(ii) *Blockboard:* This is made from a blockboard which is a laminated board. The surface should be free from defects in the way of plugs or knots. The edges are painted yellow. Thickness is ½ in. Blockboard may be further improved by the fitting of metal strips at each end.



Drawing Boards.
Plywood/Blockboard.
Cleated (clamped) Board.
Engineers Board.

(iii) *Pine* or *Spruce:* This board is fabricated from tongued and grooved timber with clamps at either end. Being fabricated in this manner, the board will not twist or warp, and the timber used gives a very smooth working surface on both sides. Thickness is $\frac{5}{8}$ in. to $\frac{3}{4}$ in.

(iv) *Engineers':* These should be made from first-quality yellow pine or silver spruce with raised ebony edge which provides the working edge for the T-square to move along. The back is grooved and it has slotted battens which allow for shrinkage or expansion. Brass pins are used for securing.

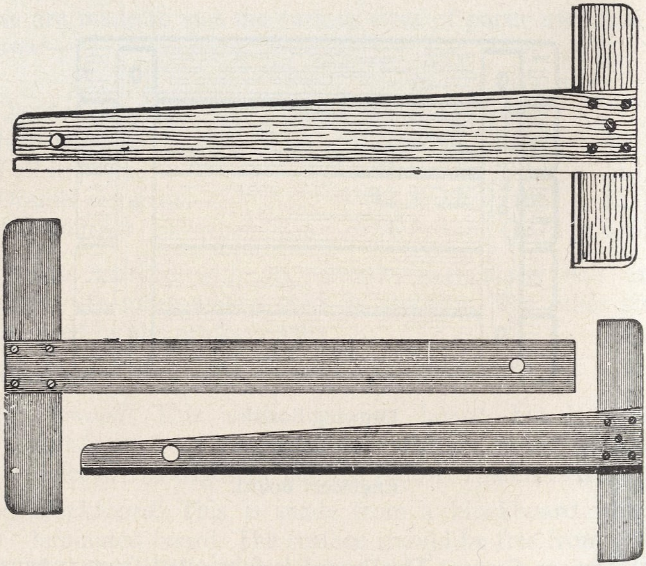
(c) Storage

All drawing boards should be stored flat and with care, so as to prevent damage to the surfaces and edges. This is particularly important in respect of the engineers' quality. They must also be kept away from damp and from hot water pipes.

T-Squares

(a) Sizes

There are two parts—firstly the stock, which is the smaller part and at the top of the "T," and secondly the blade, the longer piece which lies on the board and against which the lines are ruled. The measurement referred to as the size is the length of the blade from inside the stock. As each size of board requires a T-square to match, it follows that the sizes required for the boards mentioned above are 16, 23, 32, 42, and 54 in. (406, 584, 813, 1067 and 1372 mm.). The first three sizes are widely used by students.



T-Squares.
Student Type.
Engineers Type.

(b) Quality

The principal grades are as follows, commencing with the cheapest:—

(i) Beech, unpolished; tapered and bevelled blade.

(ii) Beech, polished; tapered and bevelled blade.

(iii) Beech, with maple edge along the working edge of the stock and blade; tapered and bevelled blade.

(iv) Engineers': These should be made from selected mahogany or sapele with ebony edges along the inside of the stock and ebony along the bevelled edge of the blade. Ebony is, of course, very hard and smooth and is, therefore, hard-wearing. The blades are fixed to the stock with brass screws and dowels, and the surfaces are highly polished.

There are also T-squares made from plastic materials, but they are not in popular demand as they are usually expensive. Some T-squares are also made with parallel blades which provide two drawing edges. These too are not so popular as tapered blades.

(c) Storage

All T-squares should be suspended vertically by the hole provided near the end of the blade. If kept flat there is a tendency for them to warp. They should certainly be kept away from damp and from hot water pipes.

Combination Drafting Units

It is now an established fact among the industrial nations of the world that engineering drawing has become the fundamental language of industry, making the drawing office a central point of scientific development both for manufacturing function and progress, and costings.

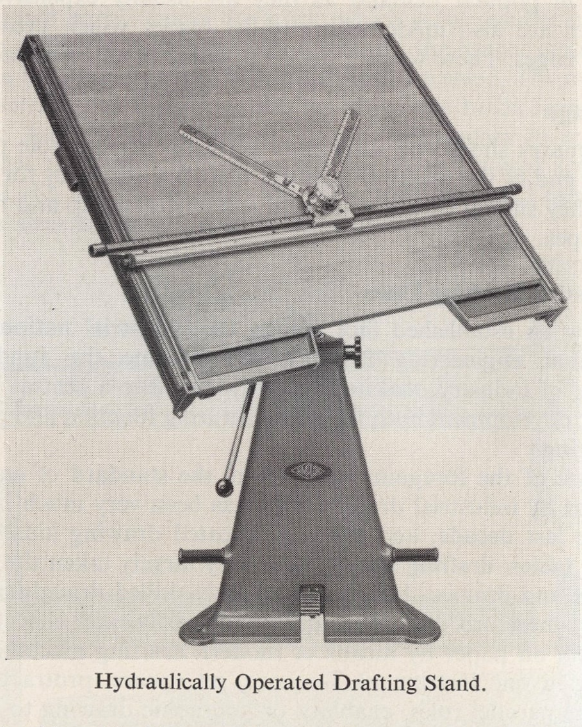
Because of the foregoing realization, the standard of equipment now used by industrial draughtsmen has been very much improved over the last decade, and the sophisticated drawing aids (**drafting machine tables**, **drafting stands**) have very largely taken the place of T-square and drawing boards. The highly-skilled draughtsman and designer, therefore, can more rapidly and easily express his thoughts accurately on paper by means of modern drafting machines which combine in one instrument T-square, set square, protractor, scale rules and parallel rules, enabling orthographic drawing to be completed in roughly half the time taken when using separate instruments. The various drafting stands enable the board to be effortlessly moved into the most comfortable position for the draughtsman when drawing at any position on the board.

Similarly, Reference Tables can be placed in the correct position so that the draughtsman has to make only the minimum amount of movement when referring to documents, other drawings, etc., on the reference table. Combined drafting boards and reference tables placed in the correct juxtaposition make this a fixed layout. The equipment can be categorized roughly into the following sections:—

(*a*) *Simple Parallel Motion Drafting Board* giving an automatic parallel motion T-square effect mounted or on framework giving the board a fixed height, but allowing it to move angularly.

(*b*) *As above*, but with simple height adjustment.

(*c*) *Parallel Motion Straightedge combined with a Drafting Head* mounted on a floor stand which gives both height and angle adjustment. To some firms this is the ultimate in equipment, but the floor stand is ugly in appearance and takes up a lot of space.



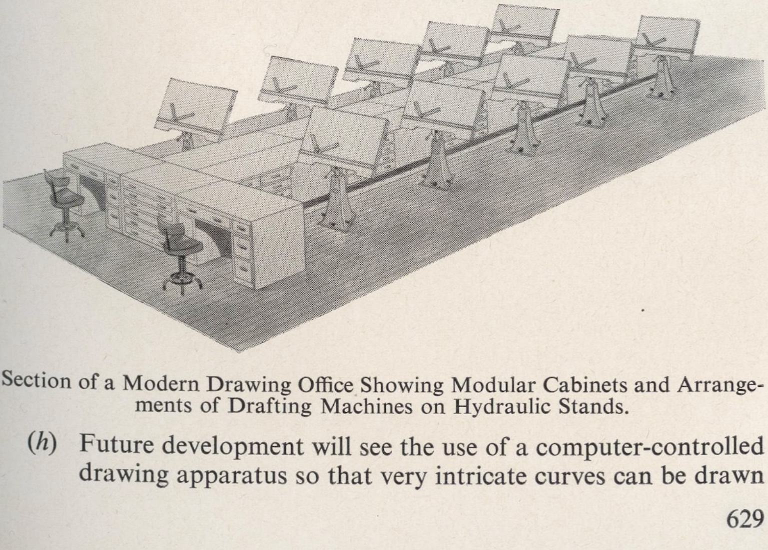
Hydraulically Operated Drafting Stand.

(*d*) *Drafting Machine*, as above, but mounted on an elegantly-styled and finished single-pedestal stand operated by hydraulic mechanism of special arrangement so the board can be moved both up and down, altered for angle, and also pivoted round the axis so that the best possible illumination can fall on the board. This drafting board can also be supplied with various linkage type drafting machines. These are very popular on the Continent, but they are poor in appearance and the overhanging mechanism is cumbersome, dangerous and space-wasting.

(*e*) *Combined Drafting Reference Units* in which the drafting machine or parallel motion unit described above is fixed to the back of a specially designed reference table so that it can be altered for both height and angle; the draughtsman uses the space behind the tilted drawing board for reference area and plan-drawer area. This is a most modern integral layout, and it enables one to calculate accurately how many draughtsmen can be accommodated in a given floor area.

(*f*) *Combined Drawing/Writing Units.* This is a simple desk which, by lifting the top, can be changed into a drafting unit by means of lifting out on special linkages a parallel motion drafting board or, in the case of one manufacturer's product, a full drafting machine. This unit has found great favour in the planning of the new technical colleges and universities, and is also now finding favour in industry for planning engineers, technical commercial managers and the publicity departments of industrial concerns.

(*g*) *The Cantilever Drafting Reference Unit* is the latest sophisticated unit in which the board is supported on an arm cantilevered out from the planfile reference table, the board movements being operated remotely by foot pedals, thus enabling the drawing office floor to have a clear area for general appearance and ease of cleaning.



Section of a Modern Drawing Office Showing Modular Cabinets and Arrangements of Drafting Machines on Hydraulic Stands.

(*h*) Future development will see the use of a computer-controlled drawing apparatus so that very intricate curves can be drawn automatically, assuming that one knows what data to feed into the computer. Such an apparatus will probably be confined to the aircraft industry, motor body building industry, structural engineering and various components used in the turbine blade industry. Standard drawing office equipment, as described in paragraphs (*a*)—(*g*) above, will be used for many years to come in various improved forms for general engineering drawing office work unless the standardization of all machine tools all over the world can be brought down to the use of approximately twenty types.

British Standards

Standards are published on students and engineers drawing boards and T-squares. Also for drawing office dwarf adjustable stands, simple free-standing stands, and free-standing counterbalanced fully adjustable stands for use with 42 × 32, 54 × 32 and 62 × 42 drawing boards. The specifications cover definitions, materials, constructional requirements, sizes, etc.

Drawing Office Furniture

Three other important items of equipment for the drawing office are filing equipment, for the storage of plans and drawings, reference tables and seating for the draughtsman. As these items are regarded as furniture, they are dealt with in the chapter on Office Furniture.

Part III

Office equipment and machinery are playing an ever-increasing part in modern business practice, organization and methods. As might be expected in this technological age, some of this equipment is of a sophisticated nature both in itself and in its application. It follows, therefore, that its sale is often through specialist dealers, and in some cases direct by manufacturer to consumer. Nevertheless, for the student wanting to specialize in this side of the industry, a knowledge of its availability and use is an essential prerequisite to a successful career. The Association's examination, Intermediate Grade Part II, is based on these subjects.

Chapter 14. Office Furniture and Equipment
,, 15. Typewriters
,, 16. Dictating and Recording Equipment
,, 17. Adding Machines and Calculators
,, 18. Mechanized Accounting
,, 19. Punched Card Systems
,, 20. Electronic Computers
,, 21. Machine Stationery
,, 22. Coin and Note Handling Equipment
,, 23. Office Reproduction Processes
,, 24. Reproduction Process Ancillary Equipment
,, 25. Mail Handling Equipment
,, 26. Telecommunications
,, 27. Mechanical Communication Systems
,, 28. Time Recorders
,, 29. Chart and Planning Systems
,, 30. Safes and Fire-Resisting Equipment

CHAPTER 14

Office Furniture and Equipment

Although office furniture is a separate subject from stationery, the two subjects are obviously allied since desks, filing cabinets, cupboards, etc., are the articles in which stationery is used and stored.

The difference between office furniture items and stationery items is so wide in terms of display space, storage space, and in financing stock, to say nothing of the knowledge of the subject that is required, that not every stationery organization is in a position to handle furniture lines in a comprehensive way. In spite of these considerations, however, many stationers are able to deal with furniture requirements, especially in those items that are directly related to the use and storage of stationery.

Space does not allow every item to be dealt with in detail, and it must be remembered that with much of this equipment, particularly the more specialized items, technical knowledge of the item and an understanding of the customer's problem are essential. Such knowledge can be obtained only by experience.

1. Filing Units

This section will not mention filing systems, as these are dealt with elsewhere, but one point cannot be over-emphasized: that the filing unit is the heart of every office, for the good reason that every organization must have some kind of filing unit in which to house its papers. No undertaking, of whatever size, can operate properly without a filing system, and a filing system demands a filing unit. The better the filing system, the more efficient will be the organization; and the better the unit in which it is housed, the more effectively the system will function. Thus, the stationer who sells the right kind of filing unit for each purpose is providing a vital service to the customer, and is building up goodwill for the future.

Filing units have two main purposes:-

(*a*) To house papers such as letters, invoices, order copies, etc.

(*b*) To act as holders of active card records such as account cards, stores records, purchase and sales records, staff records, etc.

Sizes

By far the most popular sizes of cabinets for filing correspondence and similar documents are the quarto or letter size and the foolscap or legal size. The quarto drawer is about 12 in. wide and 10½ in.

high, so that it will house a filing folder large enough to take any ordinary letter paper. The foolscap drawer is about 15 in. wide, so that it will house a folder that will take papers 3 in. longer than the normal letter size, but of the same width. These are inside measurements.

Many more foolscap cabinets are used than quarto cabinets. This is due to the proliferation of papers of foolscap size. It is interesting to note that before the second World War the use of letter size units exceeded that of foolscap size units by a wide margin: since the war, many organizations seem to order foolscap cabinets almost automatically, even if they are to be used purely for housing correspondence. This situation implies that it is always a good service to the customer to check the size of papers to be housed in the cabinet. If a quarto cabinet is adequate for the size to be filed, space and cost are saved.

Comments must be interpolated here in respect of a third size, that of A4. The international size A4 has already been mentioned elsewhere in this book, so that in this section further reference is directed to it only so far as the filing units are concerned. At present only a limited number of cabinets is available, owing to the fact that the size is not yet in general use. Furthermore, many manufacturers are waiting for publication of a British Standard on the subject in relation to filing cabinets. At present the sizes enjoy wide popularity only in continental countries, but without doubt they will be used more and more in this country in the future. Meanwhile, one reason for the increasing popularity of the foolscap size cabinet is that it will accommodate papers of A4 size—*i.e.*, 11¾ in. × 8¼ in.

Heights

The majority of cabinets are made with from one to five drawers, each of which can be used for a particular function.

Standard Purpose Cabinets

Most cabinets can be used for what is known generally as vertical filing—*i.e.*, where folders rest on the floor of the drawer and are held upright by compressor plates. Alternatively they are fitted with rails or side members to take the more popular suspended filing systems. In many cases the cabinets are made so they are interchangeable.

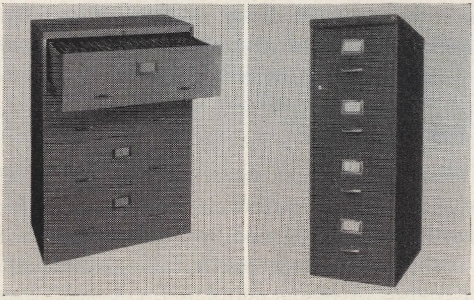
Where a cabinet has been made only for use with a compressor plate, it is easily converted by the use of a "chassis" for suspension filing.

(a) Five-Drawer Cabinets

This unit is about 60 in. high—too tall for convenient and continuous use of the top drawer. Its function is to increase the number of papers which can be housed in a given floor space, so it is used where space is a major consideration. It is frequently used in transfer filing departments where appearance is not so important and where reference is not so frequent as to current files.

(b) Four-Drawer Cabinets

This is the cabinet in greatest demand, as the overall height of about 52 in. makes it possible for a person of ordinary height to see easily into the top drawer and to insert and extract folders. In other words, this four-drawer unit enables the greatest number of papers to be housed on the smallest floor space without any difficulty being experienced by the person using it. Because of the great demand for these four-drawer units, manufacturers produce them in large quantities, so they are cheaper in proportion to their capacity than the other models.



Four-Drawer Filing Cabinets.

An alternative four-drawer cabinet is available with 50 per cent. extra file capacity. This unit can take quarto, foolscap or A4 sizes, of files, assembled either transversely across the drawer or in two sections side by side, and can be accommodated more easily in passage ways where floor space is at a premium.

(c) Three-Drawer Cabinets

This unit is about 40 in. high, so a line or "battery" of them makes an ideal counter or barrier. They have come to be known as "counter heights," combining the functions of a filing cabinet and a counter. They conserve office space and increase efficiency in many cases by housing papers at the place where they are frequently used.

(d) Two-Drawer Cabinets

This is called a "desk height" cabinet. About 30 in. high, it is often used beside or near a desk to house papers frequently referred to and as an extension of the desk space.

(e) One-Drawer Cabinets

Obviously this unit is for very small filing systems, but it is suitable for use underneath or on top of a counter or where space is very limited.

Special Purpose Cabinets

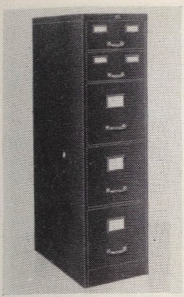
Equipment is often required for filing papers, documents etc. outside the normal range of letter and card sizes. While, of course, the drawers in such units vary in size, the outside dimensions of the units usually remain the same as to height and depth as in the normal quarto and foolscap units. Naturally, the purpose of maintaining the standard height and depth is that a line or "battery" of units containing material of many different sizes and descriptions may be arranged to present the neatest possible appearance in the office. The function of the commerical stationer is to recognize the possibilities of such a wide range of filing equipment and to be able to analyse a customer's requirement and to supply the correct unit for each purpose. Some of the more specialized units are as follows.

(a) Substitute Drawer Inserts

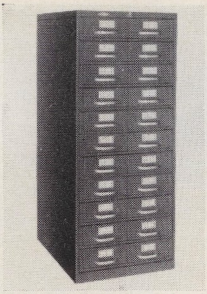
Although it is true that the vast majority of business papers are filed in either quarto or foolscap cabinets, there are, of course, many other sizes of cards and papers used in business for which filing units are necessary. It sometimes happens that it is convenient to have one unit which is capable of being adapted for several types and sizes of filing matter. To meet this requirement, some manufacturers of office equipment make what may be called "substitute drawer inserts," with the idea of replacing an ordinary quarto or foolscap size drawer by a drawer or drawers suitable for filing cards or documents of various sizes. For example, it would be possible to fit a filing cabinet with drawers to file 5 in. × 3 in. and 6 in. × 4 in. cards, folded documents of various sizes and normal quarto or foolscap size papers, and also to have box drawers to house packets of stationery or anything else of suitable size.

(b) Oversize Filing Units

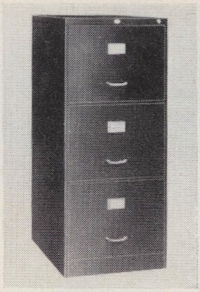
Sometimes papers need to be housed which are wider than the normal foolscap sheet. A unit is available of foolscap width—*i.e.* about 15 in.—having a clear inside height of about 14 in. as against the normal height of about 10½ in. in a foolscap drawer. There are also units with drawer widths up to about 18 in. with the same drawer height of about 14 in. These oversize units are made three drawers in height, and the overall height is the same as for a standard quarto or foolscap cabinet—*i.e.*, about 52 in.



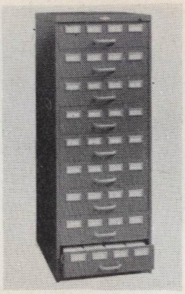
Insert Drawer Cabinet.



Punched Card Cabinet.



Oversize or X-Ray Film Cabinet.



Microfilm Cabinet.

(c) X-ray Film Cabinets

The filing of X-ray films and other photographic negatives is a most important matter, particularly, of course, in hospitals. A unit as mentioned above, but with drawers about 18 in. wide and about 14 in. high, is suitable for this purpose.

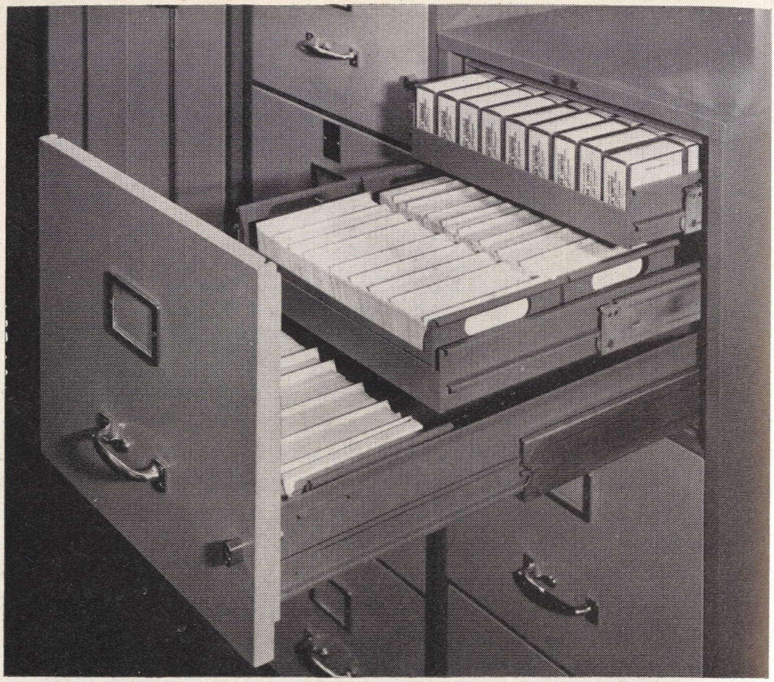
(d) Microfilm Storage Units

With the development of microfilm systems that is taking place in many large organizations, the storage of the completed films is increasingly important. Units are available of the same outside dimensions as to height and depth as four-drawer letter cabinets, and these microfilm units generally consist of nine drawers, each with four compartments of suitable size to house 16 mm. or 35 mm. films in boxes or cassettes.

(e) Punched Card Units

Punched card systems are now commonplace, so there is considerable demand for accommodation for housing the cards. This is available in many different forms, but one method is to use a standard eleven-drawer unit to take the popular 80 column punched card which measures $7\frac{3}{8}$ in. × $3\frac{1}{4}$ in. Again, the overall height and depth of such a cabinet line up with those of the four-drawer quarto or foolscap filing cabinets.

For convenience, it should also be mentioned here that where a limited quantity of cards is within the control of one card operator, as in data processing, it is convenient to house these cards in single or multiple wheels so that they all can be accessible to the operator and also to other members of the staff without delaying the machine work.



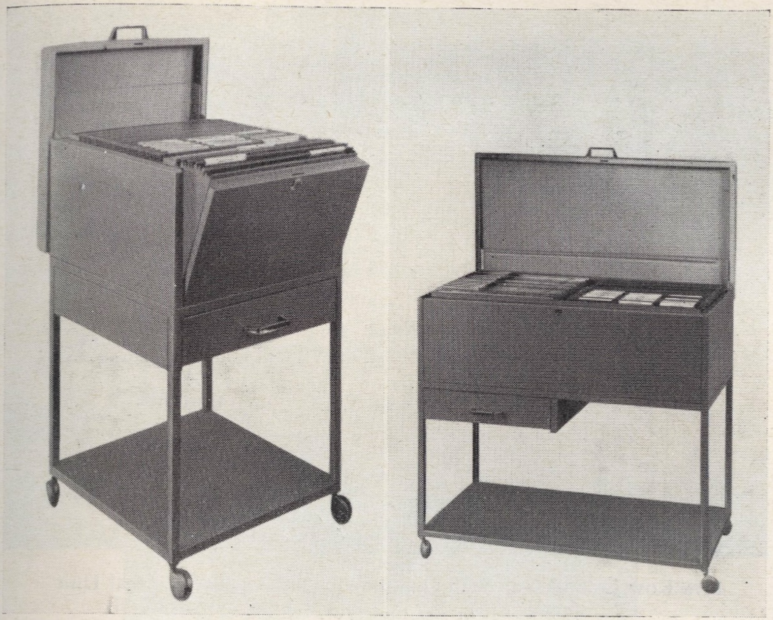
Record Protection Cabinet.

(f) Record Protection Equipment

With the increasing use of mechanised accounting and other similar systems, it is vitally important to house ledger posting trays and contents (in fact all commercially useful documents and files) in insulated equipment which provides adequate protection against the fire hazard. Equipment designed especially for this function is usually available in standard one, two, three and four drawer style cabinets. It is also available in cupboard units and others designed specifically for housing punched cards, microfilm, magnetic tapes, etc. In addition to protection against fire, this equipment also affords a measure of burglar protection.

(g) Mobile Filing Trolleys

A mobile filing trolley is virtually a filing cabinet on wheels, and is particularly useful when mobility of filing is required. There are several models available, of strong steel construction. They normally have dust-proof lids which form useful work surfaces and are so hinged that they hang down at the side when the trolley is in use. A drawer can be fitted underneath the cabinet for extra storage space, and a bottom shelf to accommodate posting trays etc.



Single and Double Width Mobile Filing Trolleys.

(h) Lateral Filing Units

This system is fully explained under Filing Systems. The housing units, however, are quite different from those previously described, and provide certain advantages.

These advantages are two-fold;

(1) One lateral unit (5-row) can accommodate the same capacity of files as two four-drawer filing units, whilst occupying a very much smaller floor area (a costly consideration these days).

(2) Papers—regardless of their overall size—can, in most cases, be filed easily in the lateral pockets provided.

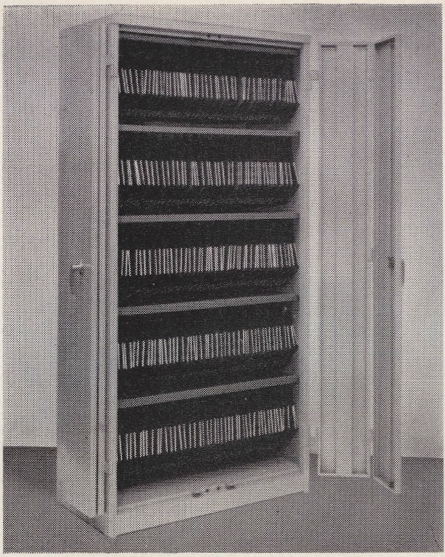
Lateral units are even more economical when supplied in six-row form, since more files are accommodated in the same floor area.

Laterals are usually offered with open fronts, linen blinds, steel roller shutters, double doors, quarter folding doors, and can be provided with locks where necessary.

Reference shelves are available as optional extras, either as part of the unit or in "clip on" form.

Units can normally be provided with a standard shelf or shelves in lieu of a row or rows of lateral rails.

Much development is going on to achieve perfected methods of "trapping" the suspended pockets on the rail or cradle so as to



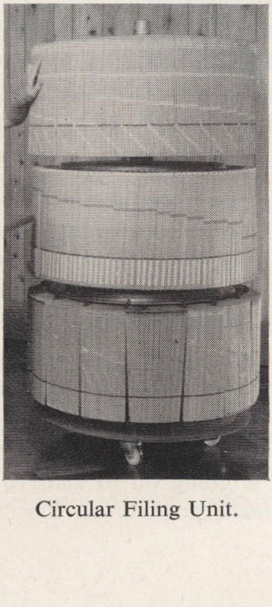
Five Row Lateral Unit with Quarter Folding Doors.

Six Row Lateral Unit with Blind.

prevent them from jumping off in use, and to improve the ease with which pockets will glide along the rail as noiselessly as possible.

Each company has developed its own method, and thus it is not usual to find that suspended lateral pockets are interchangeable between one manufacturer and another.

Lateral units, owing to their floor space economy, can be sited



Circular Filing Unit.

along walls or in wide corridors, or, in open plan offices, used back to back in banks or rows to form divisions between one section or department and another. From the point of view of ease of reference they are just as convenient once one has become accustomed to reading vertical title strips, as opposed to the more normal horizontal title strip as currently used in filing cabinets.

Circular Units

Units of one, two, three, four, or five tier in circular form also operate on the lateral method of filing. The tiers rotate independently of each other. Some equipment also incorporates retractable doors.

Electrically Operated Filing Unit.

Electrically Operated Units

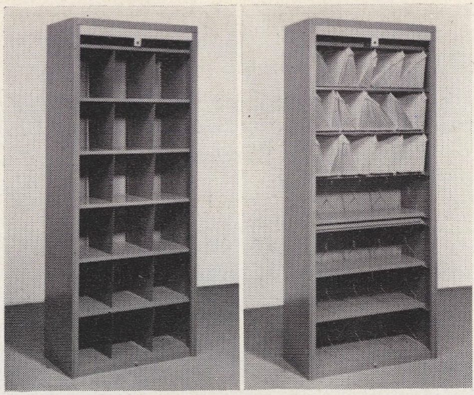
The lateral principle of filing is now extended to powered units. File covers are housed vertically and laterally on moving shelves. Each shelf is brought quickly to the point of operation by pressing its appropriate button on a control panel.

(i) Shelf Filing Units

This system of filing is very adaptable as ordinary shelves or fixtures can be used. However, where units are particularly required these are usually 6 ft. high by 3 ft. or 6 ft. in width. They can be simply an arrangement of shelves in a free-standing unit, or a cupboard type unit fitted with doors, roller blinds or steel shutters, and can be single or double sided.

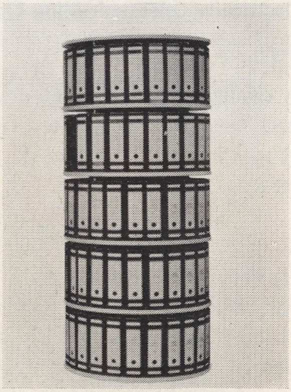
(j) Rotary Lever-Arch Units

The lever-arch file has been in use since the end of the nineteenth century, and in all these years has been subject to only one criticism. As the mechanism is just as bulky whether full or empty, an



Shelf Filing Units with Blind.

installation uses more space than the material filed. Space is now a vital factor, and out of this has come the rotary filing unit to house lever-arch files. Because of the design of the mechanism, the lever-arch file is always wedge-shaped. If wedges are collected into a group they form a circle, and this is the idea behind the rotary unit. Not only does this eliminate any wastage of space between the files, but it also increases accessibility, with a saving of floor space. To achieve maximum economy rotary units can be placed back to back, halving the number of floor aisles and providing solid filing to any convenient height.



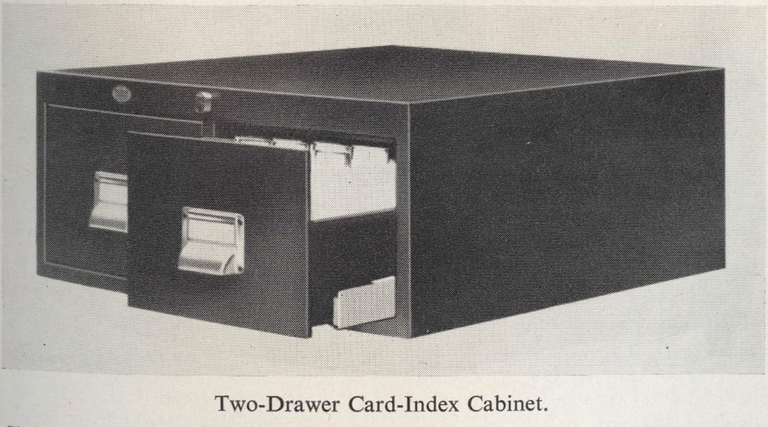
Rotary Lever Arch Unit.

(k) Multi-Drawer Cabinets

There is a wide selection of steel multi-drawer cabinets, the drawers being of various dimensions, and from 4 to 30 in number. Because of the large range of drawer sizes in width, depth and height, the cabinet can be put to very many uses; in addition to the flat filing of

Multi-drawer Cabinets.

papers and documents, numerous types of small components can be kept—*e.g.*, instruments, watches, etc. The cabinets are available in desk and floor models from 7 in. to 39 in. in height. The insides of the drawers can be divided into compartments by using removable metal divisions. Spring-loaded compressor plates are available for some models, and clips similar to box file clips can be fitted inside the drawers if required. Some cabinets are available with special drawers to house 3 in. × 1 in. glass micro-slides and 2 in. × 2 in. transparencies. Some have a cupboard with door and shelves incorporated under the drawers.



Two-Drawer Card-Index Cabinet.

(l) Card-Index Cabinets

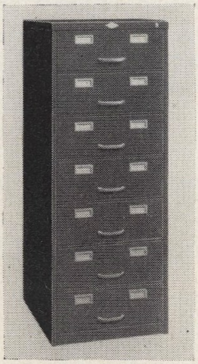
These are made in several grades, some being useful for current records of a semi-active nature, others being more suitable for the storage of information to which only infrequent reference is necessary. They are usually made in single-drawer, two-drawer, four-drawer and six-drawer units for more active records, while the storage units are generally only single-drawer and two-drawer cases. Each drawer accommodates on average 1,000 of the normal type of record card.

(m) Multiple Drawer Card-Index Filing Units

Lining up as to height and depth with four-drawer quarto and foolscap files, these card filing units are made for the standard card sizes—5 in. × 3 in., 6 in. × 4 in., 8 in. × 5 in., and 9 in. × 6 in. They are used where it is necessary to house large numbers of vertically filed cards. The number of drawers in these units varies, naturally, according to the card size, the usual arrangement being as follows:—

11 double compartment drawers for 5 in. × 3 in. cards.
9 ,, ,, ,, ,, 6 in. × 4 in. cards.
7 ,, ,, ,, ,, 8 in. × 5 in. cards.
6 ,, ,, ,, ,, 9 in. × 6 in. cards.

The main advantage of such units is that they file a large number of cards in the minimum of floor space.



Multi-Drawer Card-Index Cabinet.

(n) Rotary Card Filing Units

Manually operated

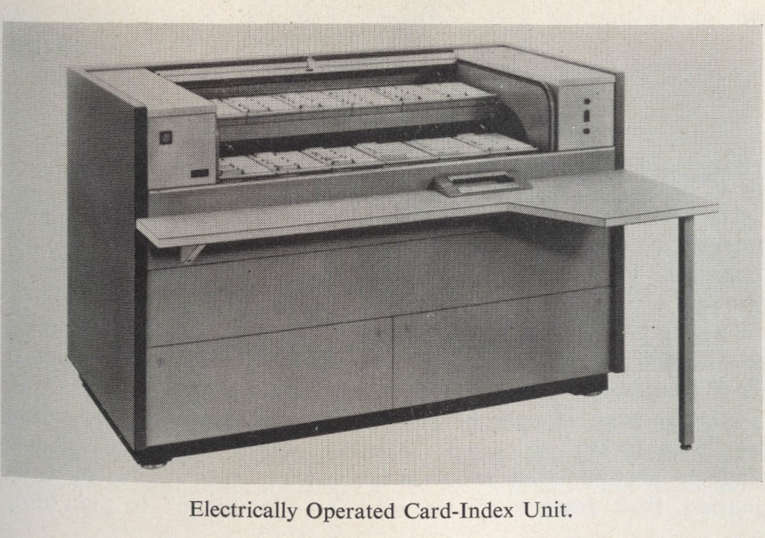
Single wheel or multiple wheel units horizontally mounted, with or without lift-out trays, offer very large capacities, especially with smaller card sizes—5 in. × 3 in. and 6 in. × 4 in.

Desks are produced with horizontal wheels built in and also with a vertical wheel or wheels. The vertical wheel in this application has the advantage of economy of space, the horizontal wheel the advantage that a partly-loaded wheel can be used as efficiently as a full one.

Rotary, Manually Operated Card-Index Unit.

Electrically operated

A variety of sophisticated equipment is now available in which trays accommodating cards are held on moving carriers. Carriers (or



Electrically Operated Card-Index Unit.

trays) required can be selected by operation of a series of buttons and presents itself within a second or two at an access point. Cards may be held in a large vertical wheel which revolves to a specific point on selection by press-button to present the card section required. Cards may be held on a multiple of small vertical wheels all rotated at the same time.

(o) Visible Index Filing Units

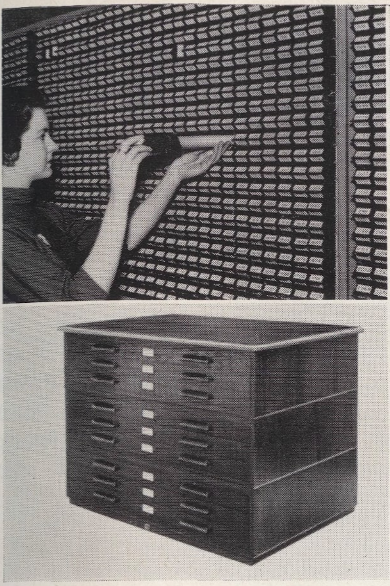
There is an active and growing demand for filing card records in such a way that the index of each card is visible, thus providing the maximum speed of entry and reference. This subject is fully covered in the sections dealing with visible systems, so that all that remains to be mentioned here is that suitable filing units are available for all standard sizes of record cards. These units are of two types, one being for cards which are hand-posted without removal from the file, and the other for cards used in machine accounting systems where the cards must necessarily be removed from the file so that postings may be made by the machine.

Visible Index Card-Index Unit.

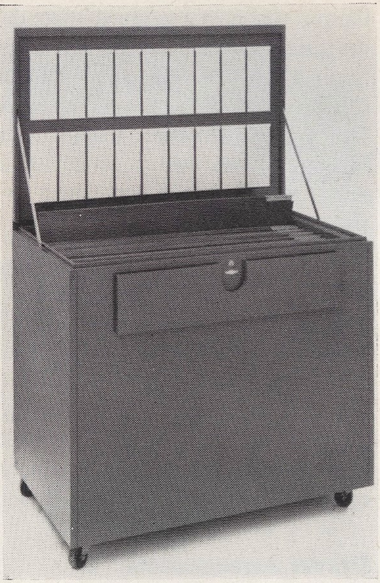
(p) Drawing Office Filing Equipment

Everyone knows that a drawing office must be furnished with drawing boards, and drawing and measuring equipment. These items are available in almost infinite variety, but the most important problem is the care of the valuable products of the drawing office—the drawings prepared by the draughtsmen. The principal factors to be considered are, first, security from damage or loss; and, second, the availability of the drawings for reference purposes.

Popular types of equipment for filing plans, drawings, and prints are "plan-drawer" units and "plan-file" units, both of which are made to accommodate all sizes of drawing from quarto to antiquarian. Plan drawers are intended for "flat filing." In plan files,



(*Top*) Tubular Plan Filing Unit.
(*Bottom*) Flat Plan Filing Unit.



Vertical Plan Filing Unit.

plans and drawings are filed "vertically" or "laterally" in systematically indexed folders. These units are used when frequent reference to the drawings is required, where sizes vary, and where floor space is a consideration.

Another form of plan filing is that in which the drawing or plan is stored in tubes, each of which are numbered for reference purposes. All types of such equipment naturally, have to conform to size requirements of the drawing office.

2. Desks & Tables

An outstanding feature of modern office desks is the emphasis placed by manufacturers on design and colour. The aim in these days is to provide elegance as well as an efficient work station.

The term "work station" is used to indicate that each type of work is studied so that the best kind of desk work-place is offered to provide adequate working surfaces and storage space for the articles and files required so as to conserve the worker's time.

Sizes

One feature of modern development in desks and work stations is that general office desks tend to be rather smaller, so as to save floor space, while executive desks tend to get larger. The depth from front to back of a general office desk is about 30 in. An executive desk, on the other hand, often has a depth of 36 in. to 42 in. or even more. Such a desk is generally in a room where the floor space is not so important and the large desk top is convenient for conference work. In the general office, where many desks are used, the size must be limited to the minimum space needed for work efficiency and for adequate air space according to the number of persons working in the same room.

Working Surface Height

The most usual height for a desk surface is 29 in. or 30 in. There is nothing rigid about this, some office workers preferring a higher desk, whilst others prefer a lower one. It is not possible to lay down any standard ideal height for a desk, for the reason that the human frame is not standardized as to size. However, for actual desk work the appropriate size is as described above and for typists the size could well be 2 to 3 inches lower.

Drawer Arrangements

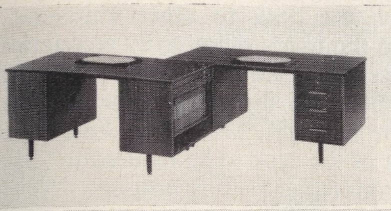
Broadly speaking, desk drawers will be a combination of a filing drawer, to house papers to which frequent reference is necessary, and box drawers which will contain card records, stationery, and other items which need to be at hand. Shallow drawers are used for a variety of sundry items.

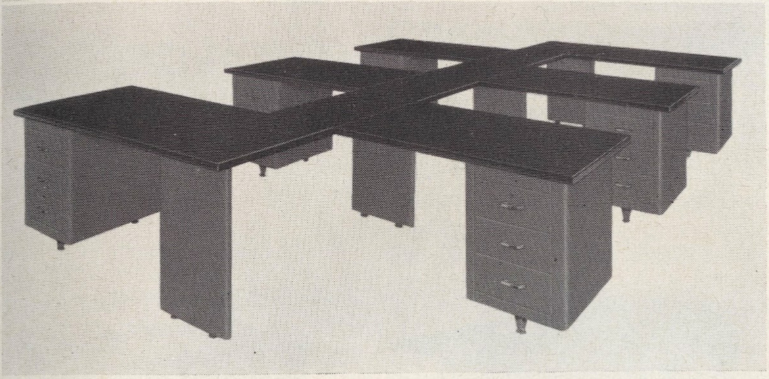
Side Extensions

In former times a desk was regarded as just a working surface of rectangular shape, and no regard was paid to the empty space on either side of the worker's chair. The modern trend is to utilize this empty space by fitting the desk with a "side extension" placed at right angles to the main desk top. This arrangement extends the working surface without increasing the floor space occupied. It is ideal for the location of a telephone and also for a typewriter or other office machine according to the work of the user.

Unit or Modular Furniture

This group method of office planning is attracting increasing popularity. Each desk, table, chair, or other unit is based on a "module" or unit of standard size and shape. These can then be assembled to suit the individual's requirements within the group, it encourages higher efficiency in workflow and greater use of available floor space. Owing to the flexibility of the system, regrouping or further extensions to the existing layout may be carried out with the minimum expense and loss of time.





(*Top left*) "Z" Shaped Formation.
(*Top right*) "L" Shaped Formation.
(*Above*) Work Flow Arrangement.

Standard Purpose Desks and Tables

Broadly speaking, desks and tables can be classified into three principal groups:—

(1) Executive.

(2) General Office.

(3) Typist.

The variety available is so vast that only a few general remarks can be made.

(1) Executive

These are made in a variety of styles to suit individual tastes. There are two trends in vogue. Traditional—i.e., a desk with full pedestals providing plenty of drawer space. One pedestal has a filing drawer, capable of housing visible suspended filing, either quarto or foolscap size, with one or two drawers. The other has three or four box drawers, with one or two capable of housing index cards. Between the pedestals there is a kneespace drawer, normally fitted with a secure lever lock which automatically locks all drawers. These desks are usually 30–30$\frac{1}{2}$ in. high, with top sizes averaging 66 in. × 36 in. to 72 in. × 42 in. maximum. The other trend is towards a desk with large top surface and few drawers—the idea being to transfer all documents etc. from the desk to other units—*i.e.*, separate filing units, kept either in the user's office or by secretaries outside the private office. These desks have shallow pedestals, one having a filing drawer for personal filing, the other having two or three box drawers, shallow in height. There is no kneespace drawer, and this allows the height of the desk to be reduced to 28½–29½ in. in keeping with a more comfortable seating posture.

Executive Type Desks in Wood and Metal.

Top sizes range from 66 in. × 36 in., 76 in. × 36 in., 86 in. × 42 in., 96 in. × 42 in., to 108 in. × 42 in.

Where minimum drawer space is required, only one pedestal is provided. In such instances a side table is provided as an extra to the desk. This makes an "L"-shaped assembly and has certain advantages—*e.g.*, the side table provides space for dictating machines, telephones, etc., keeping the main top clear.

(2) General Office

For departmental managers, the trend is towards generous drawer space, with one pedestal always with filing drawer capable of housing visible suspended filing. Height is usually 28½–29½ in., with top sizes 60 in. × 30 in. to 72 in. × 36 in.

For clerks, the size of top is usually 54 in. × 30 in. or 60 in. × 30 in., and, where little drawer space is required, a single pedestal desk is satisfactory. This desk usually has three box drawers, or one box drawer and one filing drawer. The top size is 48 in. × 27 in., 48 in. × 30 in., or 54 in. × 30 in. according to the space available.

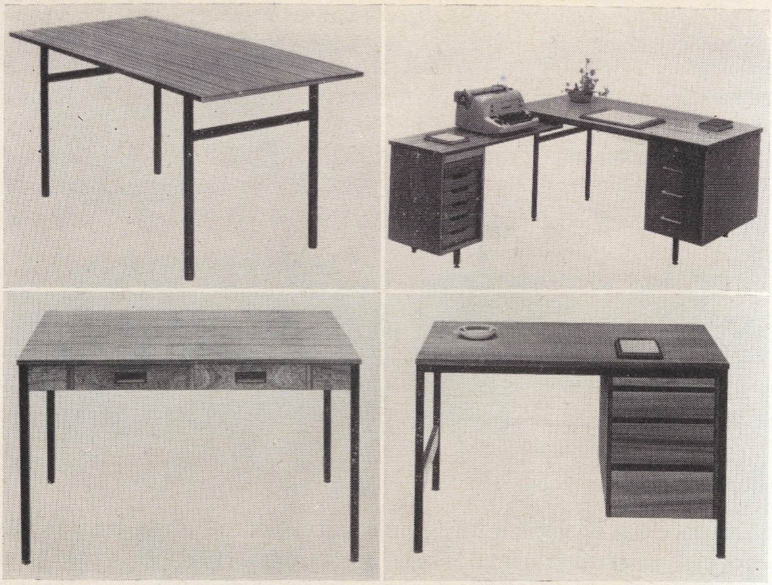
General Office Type Desks in Wood and Metal.

In modern open-plan offices, clerical desks are often arranged as work flow arrangements. These are normally "Z" formations in multiple assemblies. The centre spine of the "Z" is either a table or a table with cabinets to house lateral filing or for storage of box files, stationery, etc. Connected to left and right of the spine table is a single pedestal desk. The desks are "modular" in character—*i.e.*, pedestals are interchangeable, and desks are capable of attachment to other units. Spine tables are usually 60 in. × 18 in. × 28–28½ in. high, and the desk tops from 42 in. × 27–30 in., 48 in. × 27–30 in. or 54 in. × 30 in., all 28–28½ in. high.

(3) Typist

This type of desk falls into two categories. Secretaries, whose duties include other kinds of work besides typewriting, need a desk where an area of the desk top can be kept clear. The current practice is to have a single pedestal desk with a pedestal of either three box drawers or two drawers and filing drawer. This desk is usually 28–29 in. high, and has a side table attachment to form an "L"-shaped unit. The side table, usually 42 in. × 18 in. × 26–27 in. high, carries the typewriter, leaving the main desk top surface free, and normally has a pedestal at one end with trays for storage of stationery. For typists who do no other work, a single pedestal desk, height 26–28½ in. according to taste, with top size of 42 in. × 25 in., 48 in. × 27 in., 48 in. × 30 in., 54 in. × 30 in. or 60 in. × 30 in., according to available space.

For other office workers there are tables, with or without drawers, of varying top sizes from 36–60 in. wide.



General Purpose Tables and Typists Desks.

Special Purpose Desks and Tables

In addition to the broad categories of executive, general office, and typist desks mentioned above, the possibility of a desk being needed for a particular purpose should not be overlooked.

Conference Tables: These fall into two categories. Standard sizes produced by manufacturers in graded lengths, usually 5 ft. 6 in. to 9 ft. and custom built sizes for individual requirements. The modern trend is towards a height of 29 in.; widths vary according to length and are usually between 2 ft. 6 in. to 3 ft. 6 in.

Reception Area and Occasional Tables: Tables of various sizes and shapes are made for the reception area or for informal use in the office. Some are made on the unit principle to match seating in the same range and afford considerable flexibility in use, since they can be used independently or to form a combined seat and table unit. Table top links are also made to join two seats or form a run of alternate chairs and tables. Height needs to be compatible with the seating and varies between approximately 12 in. to 18 in.

Machine Tables: Special desks are made to facilitate use of an office machine. The desk top usually incorporates a "well," positioned either in front of, or offset to the side of, the operator. The bottom of the well is sometimes in the form of a sliding platform so that the machine can be pulled out from the well for more convenient operation.

Typewriter Desk.

Drawing Office Tables: There are two principal items used by the draughtsman, in association with drafting stands. One is the Reference Table used at the side of, or at right angles to, the drafting stand. The other is the Drafting Bench which accommodates drafting equipment such as dwarf stand and board. Both are generally provided with a long drawer for drawings and small drawers for instruments. Sometimes pedestal drawers may be incorporated. They may be used separately or as combined units. Sizes conform to usual drawing office requirements.

3. Seating

The chair is a most important piece of office furniture, its purpose being to provide working comfort and to minimize physical strain and consequent fatigue. All too often, however, insufficient attention is paid to the requirements of the user. Apart from the seating being suitable from a functional point of view, it must also be correctly designed to eliminate so far as possible incorrect posture.

The seated posture is the least suited to the anatomy of man to maintain for any length of time. Physiotherapists have shown just how unaturally the various parts of the body react when placed in a sitting position. Posture, however, must not be confused with comfort, but such is the importance of both that seating must be sufficiently well designed to reduce the body stresses and strains and to allow the worker to perform his duties with maximum efficiency. To meet these needs, **posture seating** has been developed, and this embraces chairs with revolving seats, adjustable for height and with adjustable backs. Chairs which do not revolve are still widely used for clerical purposes, but have varying seat heights to match desk heights.

Standard Purpose Seating

The main types of seating for office use can be classified for particular usage as follows:—

(1) Executive.
(2) General office.
(3) Typist.

(1) Executive

These vary considerably in design. They are usually large in size, and of luxurious appearance. Seat, back and arm-rests are well upholstered, either in leather or moquette. Some models are fitted with revolving or tilting action, and with castors. Often slightly smaller chairs, complementary in design, are available to produce an "office suite" effect.

Executive Type Chairs.

(2) General Office

In the main, these are used by general clerical workers up to junior executive level. For the former they are usually made of hardwood with padded seat and slatted or half-padded back. Alternatively, they may be of the tubular steel variety. In both cases the covering is PVC or moquette. For the junior executive similar chairs are used, but with a more generous seat area, arm-rests and additional upholstery. The usual seat height averages 17–18 in.

General Office Type Chairs.

Typists Chairs.

(3) Typists

In this type of seating, correct posture must be all-important. Typists' chairs are mainly made of steel, with PVC or moquette seat and back-rest, and have adjustments for height and angle of back-rest to conform to the curvature of the spine. In addition, the seat swivels, and often castors are fitted. Some models incorporate a circular and tubular foot-rest which further assists to combat fatigue.

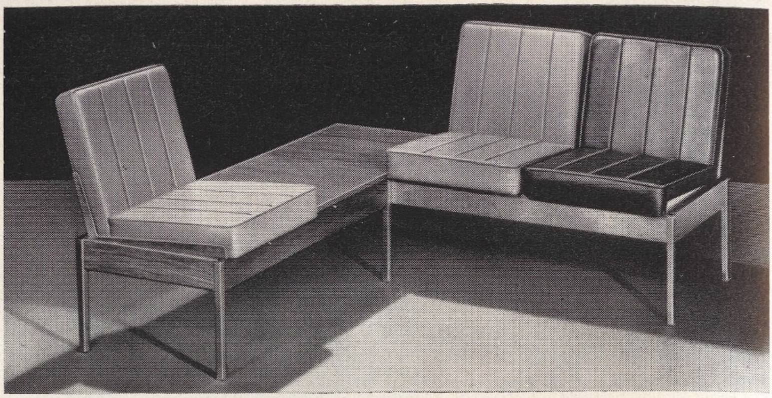
Special Purpose Seating

As with desks and tables, there are varieties of seating for special needs. The principal categories are:—

Conference Chairs: These are normally 1 in. to 1½ in. higher than guest or visitors chairs. Seat height varies from 18 in. to 19 in. They are designed to ensure alertness as opposed to relaxed seating. The angle of the back is sometimes more upright than similar chairs for guest or visitor use.

Reception Area Seating: This type of seating should give an appearance of comfort and should be compatible with the general decor of the reception area. Chairs, settees, and bench seats are available with wooden or steel frames in a great variety of styles, designs, and coverings.

The modular or unit form is widely used, since chairs, bench seats, and settees are all made in a uniform and proportionate size, which enables them to be placed together to make single or joined rows of seating. Chairs of this type are usually armless and "end" chairs with right or left hand arms are used to convert into settee



Reception Area Seating Arrangement.

type seating as required. To form an L-shaped arrangement, corner chairs are used, with either square or rounded backs.

Bench types seats also feature in the unit system, consisting of two or three backless seating units together, mounted on a frame. Alternatively each unit can be used separately.

Machine Operators Chairs: These are virtually the same as typists chairs. As with typists chairs the requirements of posture seating figure prominently in the design. Adjustability of seat height and backrest are all important and a footrest should be incorporated.

Drawing Office Chairs: Like typists, the draughtsman has to be specially considered with regard to posture. Often the best form of seating is offered by stools made from wood or steel, in varying fixed heights, with PVC or moquette upholstered seat.

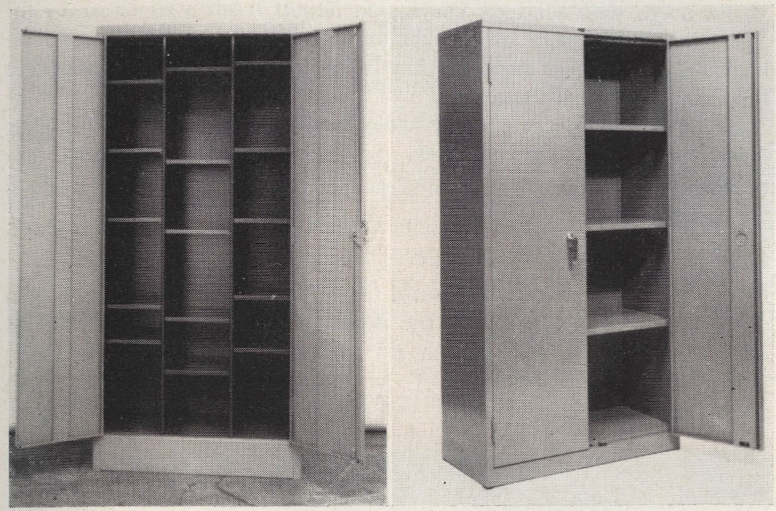
Swivel chairs, with height and back-rest adjustments similar to those of typists' chairs, are available, but it is important that the correct seat height adjustment is provided as some draughtsmen work at an upright angled board.

4. Miscellaneous Units

Other items necessary in an adequately furnished office include the following:

Office Cupboards

Office cupboards are not usually called upon to carry very heavy weights, so cupboards made with shelves resting upon easily adjustable clips are more suitable for office use than the bolt and nut type, especially where the items to be stored may vary frequently and considerably in size and quantity. Cupboards of this type are made in several sizes, the most popular size being about 6 ft. in

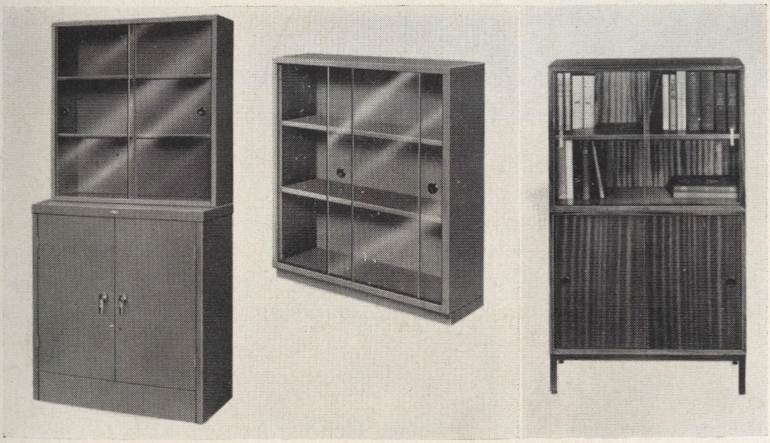


Pigeon Hole and Shelf Type Cupboards.

height, 18 in. deep, and 36 in. in width. A cupboard of similar construction is also made "desk-height" (about 30 in.) and 24 in. wide. This unit is useful for storing small articles, and also as a telephone stand.

Bookcases

These are invaluable in the well-equipped office for the tidy and convenient storage of books of reference. One popular type consists of sections fitted with glass fronts which disappear into the top of the section when opened. The usual size is about 30 in. wide and



Bookcases in Metal and Wood.

10 in. deep, with sections varying in height from 8 to 12 or 14 in. The great advantage of the sectional bookcase is that it can be built up to whatever capacity may be required. It is always complete but ever capable of extension.

Another type is a cupboard-bookcase with hinged or sliding glass doors and adjustable shelves. Sometimes such bookcases are mounted on cupboards of greater depth which provide storage space for stationery etc.

Hat and Coat Accommodation

In the executive office this should take the form of a wardrobe of a design and colour to match the desk and filing equipment. In an office occupied by one person a combination cupboard-wardrobe unit is often used consisting of two compartments, one fitted with hat shelf, coat rod and hooks, and the other with shelves.

Multiple Locker Arrangement.

For the general office it is desirable for all hats and coats to be accommodated in separate lockers for each person, and these lockers should be located in cloakrooms. The simple type of locker has a hat shelf and two or three hooks, and the door is louvred for ventilation. The minimum effective size is about 72 in. high × 12 in. × 12 in. Lockers 15 or 18 in. square are desirable where space permits.

Home "Office" Units

Businessmen often work at home. Representatives, sales managers, students etc., require facilities to enable them to work and store their records without inconvenience to the home. Units are designed to house everything in a compact arrangement. When open, it provides space for writing, typewriter, files, stationery etc. Closed, it has the appearance of a neat item of furniture.

Suites

While this position in the chapter is not the most logical at which to mention suites, they are nevertheless included here for convenience. Practically all items of furniture mentioned so far are available in matching suites. For the top level executive they may be tailor-made to the personal requirements of the user, and will undoubtedly be considered along with such items as carpets, curtains and general decor of the office. On the other hand it is possible to purchase stock lines designed to build up into matching sets, either as a complete set, or item by item as finance permits.

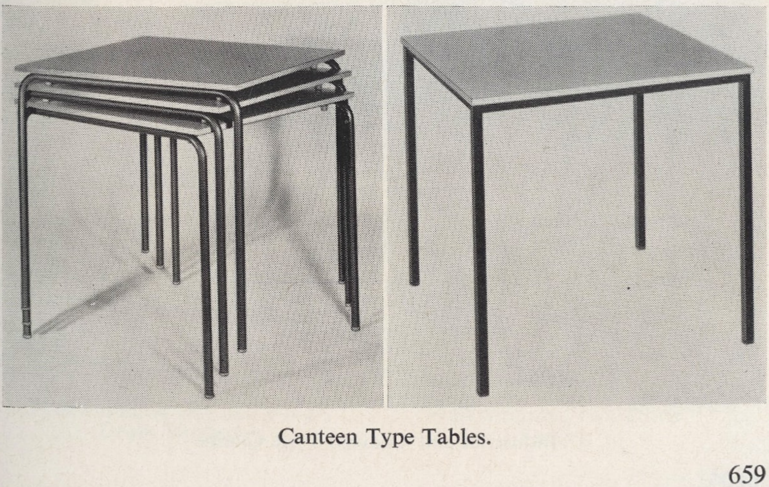
5. Industrial & Canteen Furniture

Tables

Design considerations for tables intended for industrial and canteen use are essentially functional. Styling may differ according to the rigidity of construction, depending upon the type of function for which the table is required, and surface coverings are dependent on durability, appearance, and hygienic factors.

Rigid construction ensuring stability of working or eating surface, applies to all forms of tables, whether of wood or steel frame construction. Tables for industrial application may need additional reinforcements if particularly hard usage is envisaged.

Table tops can be covered in lino or wood if used as a general working surface. Table surfaces intended for catering applications



Canteen Type Tables.

must be impervious to stains, and easily cleanable. Plastic laminate surfaces which possess non-absorbent qualities are ideally suited for conditions where hygiene is an important factor.

It is essential that the height of the tables should be related to seat height, and the area of table surface should efficiently serve the purpose for which it was intended; the size range for table tops must be relative to seating capacity. In general use, round tables range from 27 in. to 36 in. in diameter. Square tables usually 30 in., and rectangular ranging from 4 ft. × 2 ft. to 6 ft. × 2 ft. 6 in.

Stackability is important where limited storage space is available and/or re-arrangement of furniture is required in rooms serving dual purpose needs. Further considerations are the facilities for linking or butting, for situations where tables may be used either singly or in banquette arrangements.

Durable frame finishes are important and epoxy powder and nylon coated metal frames produce protective finishes which withstand chipping and scuffing.

Chairs

The question of posture must again be to the forefront, as well as the functional aspect. In factories, output can increase or decrease according to the type of seating in use.

This type of seating ranges from simple stools with wooden seats at fixed heights to chairs and adjustable type stools and chairs.

Industrial and Canteen Type Chairs.

Some types are specially designed for specific operations—*e.g.*, seats designed to tip up, seats which run on tracks, etc.

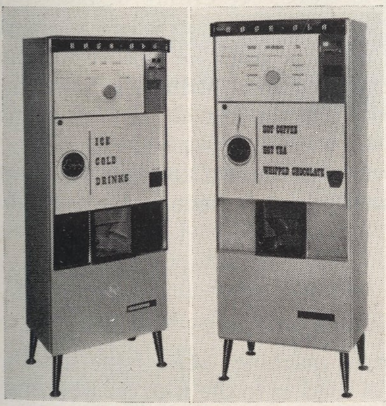
With canteen seating, the stacking capability is an important point, together with light yet strong construction.

Although steel dominates in the materials used, PVC is used extensively for upholstery, and nylon coating to the metal in order to prevent chipping is common. A new material, polypropylene, is now being used for various types of seating. This is moulded to produce the back and seat in one piece, which is fixed to a steel frame. These chairs are extremely strong, resilient and comfortable, and they can easily be stacked. Loose covers can be fitted to enhance their appearance.

6. Vending Machines

Early vending machines date back to the early 1800s and took the form of coin actuated tobacco or snuff boxes. It was not, however, until about 1880 that inventors began to see the commercial possibilities of vending, and machines were designed for selling postage stamps, postcards, and envelopes containing notepaper. From then on the range of items was continually extended and machines vending matches, cigarettes, confectionery and many other commodities became part of the national scene.

Vending machines are not, therefore, a modern invention. The fact that they are generally accepted as such, is due to the tremendous development in this field since the 1950s. This was prompted by the realization that machines were needed to take over work hitherto undertaken by manual labour, which was becoming uneconomical, as a result of shorter working hours and increased labour costs.



Free Standing Hot and Cold Drink Venders.

Wall Mounted Hot Drink Vender.

The vending industry now extends over a very wide area and is likely to expand in even greater variety. This section, however, is only concerned with those machines for installation in offices and factories.

Most employers provide refreshment of some sort for their staff. Refreshment, in this context, can mean anything from a full-scale works canteen to a twice-daily office "brew-up." These services can present many problems, perhaps the biggest of which is cost. There may, for example, have to be a subsidy of some kind, or permanent staff may have to be engaged to operate the service.

The answer to the refreshment problem is the installation of automatic vending equipment. Prices charged can be sufficiently low to be good value as far as the staff are concerned, yet high enough to make the installation pay for itself—and possibly make a small profit.

There are basically two ways of acquiring vending equipment; the company can either contract an outside firm to provide and operate the machines, or it can own and service its own machines. Whichever way is chosen, efficiency improves and is almost always accompanied by saving in costs, as well as allowing management to provide a "round the clock" refreshment service to staff who may be working overtime hours.

Automatic vending machines for refreshments fall into two main categories—beverage and food venders.

Beverage Venders

These can be sub-divided again to:—

Hot Drink Venders: These can vend up to ten different selections of tea, coffee, chocolate and soup. The latest model even has a cold drink selection which, by means of a flick switch, can be substituted for one of the hot drinks when required. According to type and capacity required, the installation for hot drinks may or may not need plumbing. Invariably machines of this type dispense into disposable paper or plastic cups, which are self-contained within the machine, but models are available for use with a firm's own china-ware if this is preferred.

Cold Drink Venders: These dispense carbonated and still drinks in cups, cans or bottles. A cooling unit is usually incorporated in the machine.

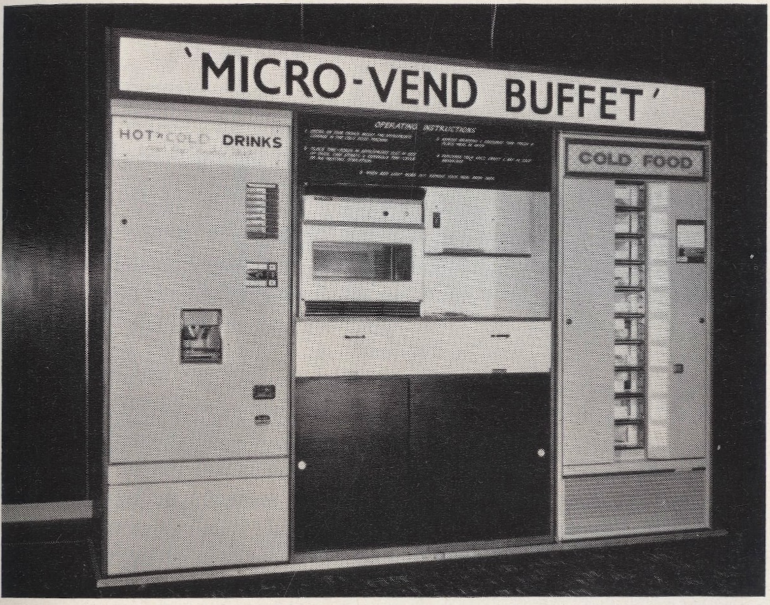
Food Venders

These can also be divided into two main groups:—

Snack and Sweet Venders: Simple machines vend light snacks, biscuits, sweets, etc. These are useful venders to site with the beverage machines and form a valuable amenity for staff. Running cost are not high, and can be met from receipts. This type of installation is extremely popular and pairs of machines are often sited at strategic points throughout the office or factory, so that employees can obtain refreshment at any time during the working day.

It is worth noting, that this has helped to accelerate a trend towards abolition of fixed work breaks, which can contribute significantly to productivity. Employees can take refreshments when individual workflow permits, and according to the requirements of their individual needs, rather than at a sometimes inconvenient set time.

Meal Venders: These supply full scale hot or cold meals. They, of course, need heating or refrigeration units.



Meal Vender with Hot and Cold Drink Unit, Cold Snacks, and Micro-Wave Reheating Unit.

The hot and cold full meal machines can be used to give a canteen service with the very minimum of cost and staff. Food can be prepared in a central kitchen and loaded into the machines in line with demand. Hot dishes will keep in the vender for several hours, and remain appetising and edible, while cold dishes can be kept in refrigerated cold food machines for much longer periods.

A refinement of this canteen service can be effected by the addition of a micro-wave reheating unit to a cold food cabinet. Pre-cooked, chilled meals are stored in the vender and reheated in seconds by the micro-wave oven. Costs can be cut with this system, as a refrigerated "food bank" of oven-ready dishes can be maintained ready for use as required.

General

There are other machines available for special purpose sales, of which the cigarette machine is notable and popular. All types of machine can be supplied in various sizes according to need. They are designed for wall fixing, or free standing use, and in some cases on mobile stands. Payment is by fixed amount, but some machines incorporate a change giving mechanism.

If properly planned, an automatic vending installation will not only provide the essential refreshment service for staff, but can do so on an entirely self-supporting basis.

7. Adjustable Shelving

Storage space of various types is needed in every industry to store products ranging from the raw materials to the finished articles.

Steel Shelving

This has been developed to such an extent that it is suitable for every storage requirement of the office, warehouse and factory, as well as for the display of goods in retail establishments.

The main features of steel shelving are simplicity, strength, security and adaptability. It consists of a number of components which can be assembled easily and quickly in such a variety of ways that a storage unit of almost any shape and size can be erected to house any type of goods. This shelving can be dismantled with equal facility, all components being fitted together with bolts and nuts, so that the arrangement of stacks, sections or bays and of pigeonholes or bins may be adjusted at will. It is not necessary for it to be fixed to walls or ceilings except in the case of high stacks of shallow depth shelves.

Shelving may be erected to any reasonable height. Posts are made up to about 10 ft. high, and even higher stacks may be built by splicing posts together.

For very large installations, "tiered" shelving is available, consisting of two, or even more, tiers connected by steel stairways and flooring. Powered hoists can also be incorporated.

Where space is restricted, shelving can be mounted on to a base fitted with wheels, which run on rails fixed to the floor. The mobile units, which can be single or double sided, are installed in front of each other, access to a particular unit being obtained by rolling the other units to one side. This can be done by hand or by means of an electric motor.

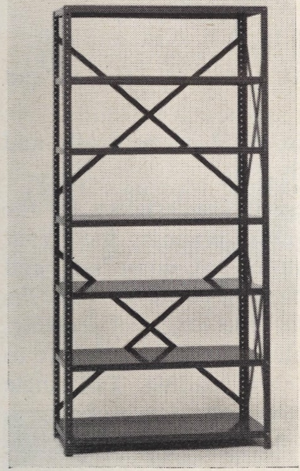
Types: Broadly speaking, there are four main types of shelving stacks, *viz.*:

(*a*) *Open shelving*, consisting simply of posts and shelves, with bracing at the sides and back to ensure rigidity.

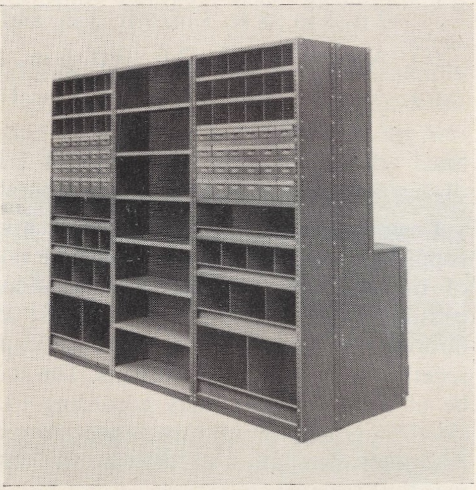
(*b*) *Closed shelving*, consisting of posts and shelves, with sheet steel backs and sides instead of bracing.

(*c*) *Closed shelving with doors*, for storage of goods requiring protection from dust, or to reduce fire risk etc.

(*d*) *Ledge-stack shelving*, in which the lower part of the stack is of greater depth than the upper part; such stacks may, of course, be of the open, closed, or cupboard type throughout or in part.



Open Steel Shelving.



Closed Steel Shelving Fitted with Dividers, Bin Fronts, Etc., and with Ledge Stack Unit at Rear.

Terms: The British Standard on steel shelving defines the following terms commonly used.

(*a*) *Bay*. The bay is the unit of adjustable steel shelving, and may be either single or double sided.

(*b*) *Single Sided Bay*. Consists of a number of adjustable shelves supported by vertical posts, the whole being accessible from the front face only.

(*c*) *Double Sided Bay*. In effect, two single sided bays joined back to back, having a common sheet back or cross-braces. The assembly thus provides two sets of shelving, each of which is accessible from its front face.

(*d*) *Stack*. Consists of a number of bays joined end to end and may be either single or double sided.

(*e*) *Compartment*. The space between any two adjacent shelves in the same bay, and is the full width of the standard bay.

(*f*) *Pigeon Holes*. The spaces resulting from the subdivision of a compartment, by the insertion of shelf dividers.

(*g*) *Bin*. A compartment or pigeon hole which is fitted with a bin front (retaining lip).

Sizes: The adaptability of adjustable shelving is due in no small measure to the size range of component parts, for which there is considerable standardisation. The usual dimensions are:—

(*a*) *Nominal Heights*. 3 ft. 3 in., 4 ft. 3 in., 5 ft. 3 in., 6 ft. 3 in., 7 ft. 3 in., 8 ft. 3 in. 9 ft. 3 in. and 10 ft. 3 in.

(*b*) *Nominal Widths*. 2 ft., 2 ft. 6 in., 3 ft., 3 ft. 6 in. and 4 ft.

(*c*) *Nominal Depths*. 1 ft., 1 ft. 3 in., 1 ft. 6 in., 2 ft. 2 ft. 6 in. and 3 ft.

Shelf adjustment is in increments of 1 in. or 2 in. vertically and divider adjustment from 1½ in. horizontally.

Construction and Erection: This is normally undertaken by the supplier. Considerable care should be taken in planning the layout of the shelving, together with consideration of immediate and possible future requirements. Of first importance is whether the flooring has the required strength to support the weight of shelving, together with maximum contents. The shelving itself may require to be of a reinforced variety according to shelf loading. Tall single sided units may require anchorage to prevent possibility of tilting. Although installation of shelving, by nature of its design, is comparatively simple, specification and ordering should be undertaken in close collaboration with the supplier.

Wood Shelving

Although steel is generally the more popular material for reasons of economy, adjustable shelving is also made from wood. Many of the comments made under steel shelving equally apply to wood so far as basic features are concerned. Similar component parts are available, although the size range is not necessarily the same. There are also various methods employed for supporting shelves and general assembly.

8. Partitions

Sectional partitioning is designed for dividing up floor space in offices, factories, warehouses, hospitals, etc. Although it is used for many reasons, the more general are:—

(1) *Flexibility:* The component parts are fitted together easily and quickly. One is not committed to the original layout, as it can

be dismantled and re-erected to any arrangement with minimum of trouble and expense and in the shortest possible time. Additional parts can be supplied.

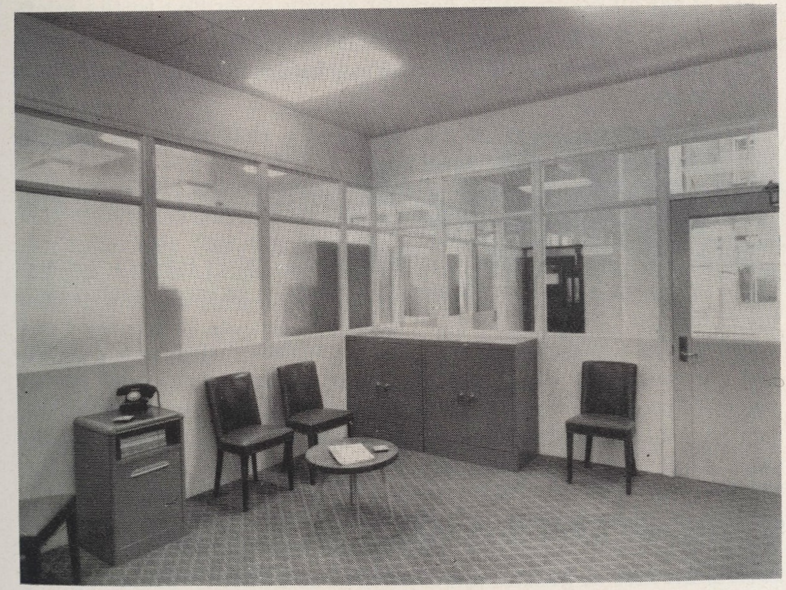
(2) *Adaptability:* The range of parts and sizes is such that floor space can be divided to suit particular needs. Many accessories are available to meet almost any requirement.

(3) *Strength:* According to the material used, it will last for indefinite periods of time. Various devices used for fixing, ensure complete rigidity. These features of durability and strength are most important, especially when an installation is re-arranged.

(4) *Appearance:* It is neat and efficient in appearance. Generally speaking, no fixing bolts are visible; in fact, sometimes no bolts or screws are used except in the post footing plates and wall channels.

(5) *Cleanliness:* Horizontal surfaces are avoided where possible, so that dust accumulation is reduced to a minimum. Cleaning is quick and easy.

(6) *Economy:* All the above mentioned factors add up to economy; this is a vital factor today when material and labour costs are so high.



Completely Partitioned Office.

Materials and Finish

Partition panels are made either of all metal, or alternatively from plaster board, plywood, hardboard, chipboard, laminated plastics, etc., which are usually framed with metal or timber. Metal panels are stove enamelled or plastic coated, while other materials are finished with vinyl, P.V.C., veneers, paint, etc. Any colour requirement can usually be accommodated. The panels can often be supplied with a primer coat of paint only, the final coat being applied on site to match any interior scheme of decoration.

Size and Construction

The panels are made in a wide variety of standard widths, and may be of ceiling, cornice, or barrier height. Adjustable wall fillers are used to take up spaces between the partitioning and the wall.

They can be solid (that is the same material, to whatever height is required); or they can be solid up to a particular height—usually about 3 ft. 6 in.—with glazing or wire mesh above.

In addition they may be of single or double wall construction. The latter is used particularly when sound insulation is important, as it is filled with sound-reducing materials. Alternatively a thermal filler may be used.

The degree of sound resistance is obviously affected by factors apart from the partitioning itself, such as the type of floor covering and ceiling. The transmission of sound can be reduced by assuring:—

(1) That all components parts fit snugly according to the interlocking principles of construction involved.

(2) That there is insulated packing in double wall panels and doors.

(3) That the method of glazing is such that the glass has no direct contact with metal parts.

(4) That spaces between cornice and ceiling are infilled with sound-resisting materials.

Doors may be single or double, hinged, swing type or sliding, single or double wall; hatches and transoms can be incorporated and, where necessary, a light roof can be fitted.

Wiring for power, telephone, etc., is normally concealed in posts and cornices, into which are also fitted light switches and power points. Accessories such as ventilators, door closers, nameplates, etc., are all usually obtainable. The installation can usually be carried out by the manufacturers or alternatively by a local builder.

9. General Considerations

Several matters of general importance in connexion with selling and installing office furniture should be mentioned, as follows:-

Materials, Colour and Finish

The principal materials used in manufacture, are steel and wood. The latter includes solid timber, laminated boards, block boards, particle boards and veneers. Many units combine both steel and wood. Other materials used include plastics and metal alloys for ancillary features, *i.e.*, drawer pulls, lable holders, trays, insert trays, etc.

Upholstery for seating includes, leather, moquette and other fabrics and P.C.V. materials.

The modern trend is for colours of office furniture units to be lighter than in the past. A medium grey is almost universally used for steel furniture, although two tone colours are now becoming popular. Natural colours for wood furniture are also increasing in popularity. No stain is used and clear lacquers reveal the natural colour of the wood and grain.

The standard stove enamel coating which has proved to be a commercially acceptable finish for steel frame furniture, has limitations in its tendency to chip and scuff. More widely used today is a new expoxy powder matt finish, which provides a superior coating four or five times thicker than stove enamel and is infinitely more durable.

Steel desks usually feature lino covered tops with alternatives in melamine (a high density plastic surface) in either solid colours or wood grain. Wood desks normally have veneered tops matching the finish of the desk. Most have a polyurethane or acid catalyst finish to withstand careless usage. Alternatives offer lino, P.V.C. or melamine surfaces for special application.

Safety

Very few accidents are attributable to the use of office furniture, but care should be taken to ensure that every unit is stable when in use. A simple rule that not more than one drawer of a filing cabinet standing alone should be opened at one time will prevent the unit from falling forward, assuming that all the weight in the unit is not concentrated in the top drawer. Steel furniture, to some extent, resists fire.

Office Layout

This is a large subject, but important factors to be considered are light and the flow of work. Natural light is preferable, of course. Artificial light should be diffused and of a type to eliminate shadows. Desks, files, machines, etc. should be so placed as to make the work flow in as straight a line as possible. The aim of layout planning is to require only a minimum of movement on the part of the workers; to save steps is to promote efficiency, and efficiency is the keynote of effective office organization.

Offices, Shops and Railway Premises Act 1963

The requirements of this Act are now beginning to be felt, and the office equipment trade welcomes this enlightened approach to working conditions in offices throughout the country. It goes without saying that in order to keep a good staff, which is difficult to come by in the first instance, it is now necessary not only to offer good wages but also to provide first-class working amenities which include modern office equipment in all its various forms.

It is not within the scope of this handbook to detail the requirements of the Act, but a few of its provisions cover such items as cleanliness, overcrowding, temperature, ventilation, lighting, sanitary, washing and drinking facilities, clothing accommodation, seating arrangements, eating facilities, fire precautions, etc. An abstract of the Act can be obtained from any Government bookshop.

British Standards

There are a number of British Standards published on the various types of equipment and furniture dealt with in this chapter. These range from anatomical, physiological and anthropometric principles and recommendations for the dimensions and design of office desks, tables and chairs; material and colour specifications; general requirements, size requirements, etc., through to standards for industrial seating, adjustable shelving, etc. They are too numerous and in many cases too technical to be incorporated for the purpose of this chapter. Wherever such equipment conforms to these standards it may be marked accordingly.

CHAPTER 15

Typewriters

In recent years, more and more stationers have come to realize the potentialities of a trade in typewriters, and have developed this side of their business. Standard office typewriters are indispensable to all commercial relations; as they are so universally employed, little need be said of the advantages of their use. Portable typewriters, however, have steadily become more and more popular over the years. Prejudice against their use for personal correspondence has been almost entirely overcome during the past thirty years, in just the same way as the prejudice against fountain pens disappeared. Since the portable is designed primarily for personal writing, the stationer is the logical selling medium.

Typewriters can be divided into four classes: (1) Portable; (2) Standard manual; (3) Standard electric; (4) Special purpose.

Between classes (1) and (2) there exists a group known as the "**semi-standard**" (or sometimes "**desk portable**") machines. These are robust and sturdy, with all the strength and almost all the features of standard manual typewriters, but they weigh no more than twice as much as a portable. They can easily be moved from place to place, and they are therefore the ideal machines for the professional home typist or the man who regularly types "on location." They are probably best taken with the portables for classification purposes.

1. Portable

Basically, the portable typewriter has all the features of the office machine in a compact, light frame. The range of portables can be categorized into light-weight, medium-weight and heavy-weight, and within these categories weights vary from approximately 9½ lb. to 21 lb. They are generally fitted with 44 keys, giving a total of 88 characters. The most popular type styles are **pica** and **elite**, but some manufacturers offer other faces in addition, designed to add a personal touch to correspondence. Carriage sizes are variable, but most portables will accommodate paper up to 9½ in. wide. The length of writing line is governed by platen length less the amount required to accommodate the margin blocks at either end. It therefore varies from 8 to 9½ in. according to model.

The higher-priced portables will be equipped with a compleet tabulator mechanism, which is a great help when column work—words or figures—is involved.

Some portables accommodate a single-colour ribbon only, but two-colour ribbons are becoming the rule. In this case, the machine is equipped with a colour-change lever, which also allows the operator to move the ribbon out of the path of the typeheads, so that they come into direct contact with the paper. This device is used for *stencil-cutting*. In single-colour ribbon machines, the ribbon must be removed to do this work. A two-colour ribbon machine can, of course, be fitted with a single colour ribbon: this may well prove to be an economy if the red portion would otherwise seldom be used.

Portable Typewriter and Carrying Case.

All portable typewriters are supplied complete with carrying case, and some also with a cleaning kit.

The obvious tendency in portables to reduce size and weight without losing any efficiency has been achieved to a remarkable degree by the newer machines on the market.

Personal correspondence can be made really personal by a wise choice of type face and, perhaps, ribbon colour. In conjunction with die-stamped notepaper, a portable with attractive type fitted with a ribbon to match the colour of the die-stamping can give a most attractive result.

A portable can be a valuable educational aid for children. Typing is now taught in many schools, and it has been shown quite conclusively that a typewriter can be a tremendous help in teaching a child to spell and to punctuate.

The ability to type is always an asset. Customers to whom the stationer normally supplies writing materials—club secretaries, church officials, political organizers, social and welfare workers, doctors and dentists, teachers, undergraduates and graduates, reporters, authors, travellers, small traders, in fact people from all walks of life—are natural prospects for this class of machine. Therefore, it is most important to be able to give an effective demonstration to a customer. The manufacturer's instruction book should be studied carefully. It is also a great advantage to know all the services and to be familiar with their correct names.

2. Standard Manual

The term "standard" was until recently normally applied to the manual office typewriter. With the increasing popularity of electric office machines it is important to distinguish between "standard manual" models and "standard electric" models.

Standard Manual Typewriter.

The features of the standard manual office machine are well known, and a few points will suffice to complete the details.

(1) The number of lines per inch on single vertical spacing is generally six, but different spacing is available on some machines—for example, to accommodate the larger styles of type. The standard spacing, however, can be varied by a feature on nearly all machines which provides for half-single and double-line spacing.

(2) The standard horizontal spacing is either 10 letters to the inch (pica) or 12 letters to the inch (elite). "Pica" and "elite" are the names of two actual type faces—the basic and most popular two—but they are first and foremost the names of standard spacings. Hence it is possible to describe the many other type faces available on both spacings with such as names "pica double gothic" or "elite italic." Most manufacturers offer a very wide range of type faces.

Two styles of figure can be used: billing figures are distinguished by the long tails of the figures 3, 5, 7 and 9, and are designed to prevent reading mistakes. Correspondence figures, on the other hand, such as 6 and 8 or 9 and 8, can easily be misread, especially at speed or on carbon copies.

(3) The length of writing line is governed by the length of the platen and the maximum distance apart at which the margin blocks can be set, and varies according to make.
The following table has been compiled from sizes offered by different manufacturers, and gives an idea of the length of the writing line related to carriage width.

Carriage size	Width of paper inches	Length of writing line
Foolscap	10½ to 12	Generally speaking, the yardstick applied to modern machines is approximately ½ in. to 1 in. less than the maximum paper width.
Draft	13	
Brief	14 to 17	
Policy	18 to 21	
Manifest	24 to 27	
Extra manifest	up to 35	

(4) A tabulator is fitted to all standard machines. Depression of the tabulator bar or key causes the carriage to move directly to a pre-determined position. Tabulating stops are key-set: this means that depression of the tabulator setting key when the carriage is at a certain point will set a tabulating stop at that point. When the tabulating bar is next depressed the carriage will automatically move directly to that point. Numbers of tabulating stops are set simply by repeating the setting operation. A tabulator clearing key is also provided which will clear stops singly or altogether.

Eight-key and ten-key tabulation is offered on most machines, either as standard or, more usually, as an extra. This differs from the bar tabulator described above in that there are eight or ten keys in place of the bar, usually marked as follows:—

8-key sterling
1d. 10d. 1s. 10s. £1 £10 £100 £1,000

10-key decimal
1 10 100 — 1,000 10,000 100,000 — 1 million 10 million

This kind of tabulation is particularly useful for the compiling of complex columns of figures, especially cash amounts.

Depression of the 1d. key of an 8-key sterling tabulator stops the carriage where the particular tabulator stop has been set for that column. The 10d. key automatically stops the carriage one space further to the left, the 1s. key three spaces further, and so on. Therefore, once the tabulator is set in the unit column, the operator can write any amount rapidly and in perfect alignment simply by depressing the appropriate key. For example £9,342. 17. 4½ would be typed by depressing the 1,000 key and then typing the amount. It is very important always to type the comma that separates the groups of thousands and the full stops between the pounds, shillings and pence columns, and to remember that five shillings must mentally be regarded as "O5" shillings to ensure that the necessary space is left in the tens of shillings column for accurate tabulation. The 10-key decimal tabulator works in a similar fashion for decimal amounts. Here again, it is important to include all the commas and decimal points needed in the amount to be typed.

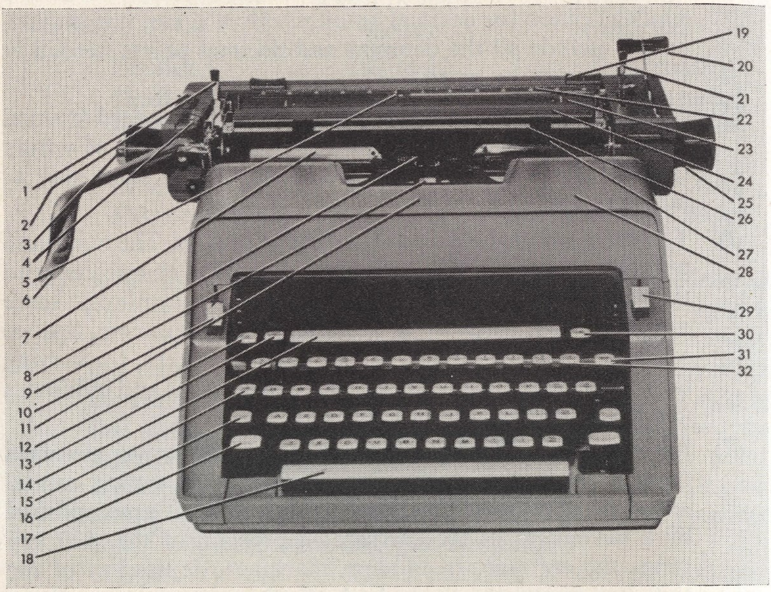
(5) Margin stops are normally set by hand in standard manual machines. A few manufacturers provide the means of setting the margins from the keyboard, in much the same way as tabulation setting.

(6) The standard keyboard has four banks of keys. The minimum number of keys is 42, each providing two characters and therefore giving a total of 84 characters (or symbols): some makes provide as many as 46 keys, or 92 characters. Special keyboards are supplied by all manufacturers to varying degrees. They are available for most professions and industries and for a wide variety of languages.

(7) An important difference between older and newer standard manuals is in the mechanism employed for typing capital letters. In older machines, the "capitals shift" is accomplished by a movement of the carriage: depression of the shift key raises the carriage. In modern machines, depression of the shift key moves the "type basket" (the unit carrying all the typebars) instead. "Basket shift" ensures very much lighter operation and is far less fatiguing for the typist, who will have to operate the shift very many times in one day.

(8) The platen (the rubber roller) plays a very important part in producing good quality typescript. A soft platen will not produce as good carbon copies as a hard one. Conversely, a hard platen is not good for no-copies work. A medium-hard platen is best for general use, and is fitted to all machines as standard. It will produce up to five or six clear carbon copies with a good machine; but beyond this a harder platen is needed, the degree of hardness depending on the number of copies required. Weight and density of paper and carbon paper obviously have a marked effect on this aspect of the machine's performance. In newer machines, platens will be easily and rapidly interchangeable, making it an easy matter to change from medium-hard to hard when necessary.

There are makes of standard office machines known as "noiseless," "silent" or "quiet" models. The noiseless feature is achieved by the principle of pressure printing as opposed to the hammer-blow principle. All other characteristics of the standard models apply to these machines, except that each typebar contains 4 characters instead of 2. The market for these machines is, however, a limited one.



Controls of a Standard Typewriter.

1. Carriage Release (Left and Right).
2. Automatic Line Finder.
3. Variable Line Spacer.
4. Line Space Selector.
5. Adjustable Paper Side Guide.
6. Carriage Return Lever and Line Space Lever.
7. Transparent Paper Holders with Ruling Devices.
8. Aligning Scale.
9. Dual Carriage Scale.
10. Personal Touch Regulator.
11. Removable Top Plate.
12. Key Release.
13. Tabulator Clear Key.
14. Tabulator Bar.
15. Backspace Key.
16. Shift Lock.
17. Shift Key.
18. Space Bar.
19. Visible Margin (Left and Right).
20. Automatic Inject-Eject Lever.
21. Paper Release Lever.
22. Perfect Positioning Margin Scale.
23. Page End Indicator and Paper Support.
24. Erasing Table.
25. Platen Knob (Left and Right).
26. Perfect Positioning Paper Bail Scale.
27. Platen (Removable).
28. Ribbon Reverse (Under Top Plate).
29. 4 Position Ribbon Indicator.
30. Tabulator Set Key.
31. Margin Release.
32. Interchangeable Type Key.

A SELECTION OF TYPE STYLES

Pica (10—1″)

abcdefghijklmnopqrs

ABCDEFGHIJKLMNOPQRS

1234567890-¾⅜⅔;⅞=,.

*"/@£_&'()?¼⅛⅓:⅝+,.

Elite Shaded-Face (12—1″)

abcdefghijklmnopqrstuv

ABCDEFGHIJKLMNOPQRSTUV

1234567890-¾⅜⅔;⅞=,.½

*"/@£_&'()?¼⅛⅓:⅝+,.%

Elite (12—1″)

abcdefghijklmnopqrstuv

ABCDEFGHIJKLMNOPQRSTUV

1234567890-¾⅜⅔;⅞=,.½

*"/@£_&'()?¼⅛⅓:⅝+,.%

Large Gothic (9—1″)

ABCDEFGHIJKLMNOP

ABCDEFGHIJKLMNOP

1234567890-¾⅜⅔;⅞=

*"/@£_&'()?¼⅛⅓:⅝+

Pica Italic (10—1″)

abcdefghijklmnopqr

ABCDEFGHIJKLMNOPQR

1234567890-¾⅜⅔;⅞=,.

*"/@£_&'()?¼⅛⅓:⅝+,.

Pin-Point (10—1″)

ABCDEFGHIJKLMNOPQR

ABCDEFGHIJKLMNOPQR

1234567890-¾⅔;×¢,

*"/£_&'()?¼⅛+:÷@,

Large Roman (10—1″)

abcdefghijklmnopqrs

ABCDEFGHIJKLMNOPQRS

1234567890-¾⅜$;⅞=,.

*"/@£_&'()?¼⅛⅓:⅝+,.

Pica-Gothic (10—1″)]

ABCDEFGHIJKLMNOPQR

ABCDEFGHIJKLMNOPQR

1234567890-¾⅜⅔;⅞=,

*"/@£_&'()?¼⅛⅓:⅝+,

3. Standard Electric

Prejudice against the electric typewriter is being overcome in just the same way as prejudice against typed personal letters. Fear of electric shocks and the feeling that the machine was "running away" were the typist's principal worries, but she soon became accustomed enough to the machine to forget them and found that she could type at a very much faster rate without tiring.

Electric office machines now equal or even outsell standard manuals in the United States, and Britain has been following suit at an ever-increasing pace in the last few years.

Earlier electric typewriters provided electric carriage return only. Although this was in itself a great advance over manuals in terms of reduced effort, newer machines have an electric keyboard as well. All the moving parts are driven electrically, and everything can be operated from the keyboard. A very light touch is all that is necessary to operate any key or service. Because the keys do not drive the linkages directly, but simply engage them with a constant electric force, electric typing is unfailingly uniform. A very large number of clear carbon copies can be obtained simply by increasing the force driving the linkage: the typist, however, does not need to put any more effort into striking the keys.

Standard Electric Typewriter.

Basically, the typehead is driven to the paper by a linkage engaging with a shaft which is constantly revolving. Very recently, important advances have been made in reducing the jerkiness which at first resulted, leading to vibration and wear in the linkages. Certain machines operate on the camshaft principle, which virtually eliminates jerkiness and unnecessary wear. Simultaneously, the keyboard angle has been systematically reduced—because key travel no longer needs to be more than a fraction of an inch—from 30°–35° in standard manuals to 9° in the most advanced model at present on the market. There has also been a move to re-introduce the fixed-carriage machine in which the carriage does not move but a "golf-ball" typehead bearing all the 90 odd characters and signs does, adjusting its position to present the appropriate face to the paper each time. This is a familiar principle in teleprinters. "Storage" of typing commands and other technical innovations too numerous to explain in detail here have brought the design of electric typewriters to a very high standard indeed.

Specialist knowledge is really required to sell electric machines efficiently, and they need servicing by experts. Some manufacturers have introduced a smaller electric machine, filling the same kind of position in the electric range as the semi-standards do in the manual range.

4. Special Purpose

Variations from General Machines

There are many variations of a special purpose typewriter—literally dozens of small attachments and devices for simplifying and speeding up different applications and for special uses. To list but a few, there are Braille typewriters which have a Braille scale in place of the normal printed or engraved scale, a Braille centring device and linefinder, together with "rough" or sandpaper-topped "home" keys. (On some models a Braille clutch-drum is also fitted.) A number of paper-holding devices may be obtained for various models, including special "locks" to hold the paper bail bar in position where file folders and other heavy documents are typed. Rapid paper-feed injectors or ejectors can be supplied by most of the larger manufacturers; special "library" platens are produced with long metal slotted inserts into which a small library card can be placed and held while details are typed. There are palm tabulators (fitted either on the right-hand or left-hand side of the machines) for quick carriage return on manual machines and stroke counters for offices employing typing bonus systems; keyboard shields are used by many typing schools to hide the keyboards from the eyes of pupils learning to touch-type. Some machines have split platens—that is, two small platens in the one carriage, each with its own line-spacing mechanism—so that labels, licences and other small items in roll form can be typed as required on one machine, whereas two machines or tiresome reloading of the platen would otherwise be necessary. Another more recent innovation is the ribbon switch. All these devices—and many more—may be obtained from different manufacturers.

Dual Feeds—Front and Back Feeding Devices

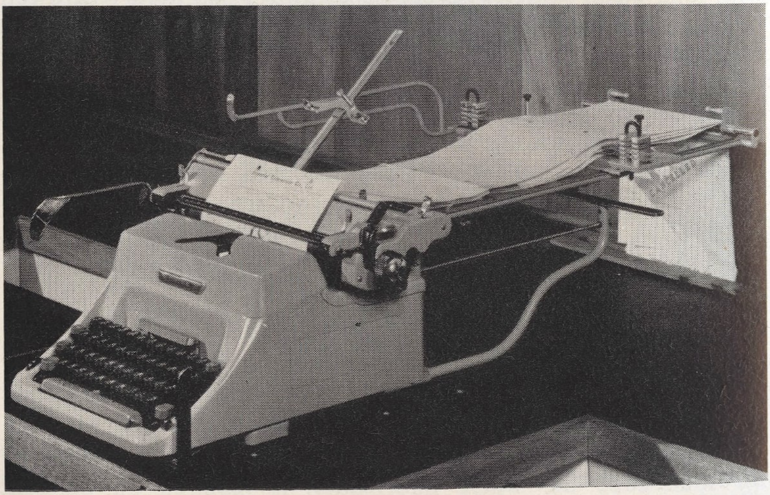
Machines fitted with any type of dual feeding device are primarily for multi-copy use where information is required on different forms and in different positions (not, therefore, straight copy work).

Dual Feed Typewriter.

Many systems are ideal for this type of machine—*e.g.*, cheque writing with summary sheets and daybook sheets all being typed in one operation, and other book-keeping and similar applications. Documents may be fed from the front of the carriage or from a separate feed at the rear of the carriage; in other cases, they may be moved across the carriage by means of a shuttle.

Form-Feed Attachments/Machines

Typewriters are the basic of equipment which may vary from a simple carbon "glove" supplied free by a continuous stationery manufacturer, through a range of special continuous stationery typewriters (manual and electric) and specially adapted attachments which fit typewriters, to extremely fast electronic equipment turning out invoices and other documents in seconds. In many cases the paper manufacturers supply their own attachments and hire them out at a nominal rental (or loan them without charge). Continuous



Continuous Stationery Typewriter.

stationery typewriters will take "sets" of fanfold (that is, stationery printed on the front and reverse and folded "fanwise") or interfold (single strip) forms having up to eight or twelve sheets (with light-weight paper and carbons).

Machines or Attachments for Reproduction Processes

There are four main reproduction processes (other than normal carbon paper or carbonless paper). Perhaps the cheapest for small runs is the hectograph or spirit process. While normal hectograph sheet carbon may be used on any typewriter without special setting up or equipment, much of the cost may be reduced on heavier work loads if either a carbon roll or, in certain circumstances, a carbon ribbon typewriter is utilized. Which is recommended depends entirely on the type of work being done, although a good guide is to use the ribbon where short pieces of copy or figures are being typed and a roll where complete lines are needed all the way down the master sheet.

Where a higher quantity—but still not a large run—is required, the stencil comes into its own on cost. Here no special typewriter is required, but a good fine type style (such as pica at ten spaces to the inch) will give the best results. It is also desirable, when ordering from the manufacturer, to mention that a typewriter is to be used for this work. Patience, an even touch, and care are needed to produce really good stencils. Aids are available by way of plastic backing, and top film sheets to be fed behind and in front of the stencils. These give a crisper impression.

Hectographic Carbon Ribbon Typewriter.

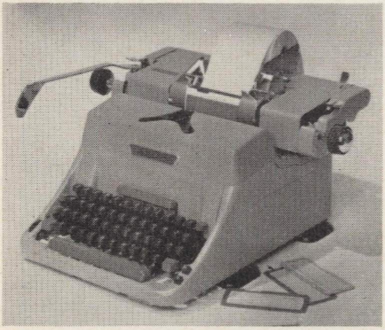
On very long runs offset litho is perhaps the only method which is economical in comparison with straight printing. Here again, no special typewriter is required—merely a good clear type style, a nice even touch and preferably a carbon ribbon attachment. As a "kiss" impression is needed (the opposite from what is required for a stencil) again the manufacturer should be told the purpose for which the machine is primarily required.

Finally, more and more photocopying methods are now being employed, and some of these systems (such as dyeline) need the fitting of special ribbons, but otherwise completely standard manual or electric typewriters will suffice.

Machines or Attachments for Other Special Uses

There are many other systems machines, but perhaps the largest group comprises the "addressing" machines.

Address stencil cards are produced by one of two mediums. If small quantities are required, a clip-on attachment can be obtained which fits over the platen of most typewriters. The address cards are then inserted and typed. But this can be a slow process, and sophisticated typewriters have been produced to speed up the work and to simplify it. Address card typers have special platens and are so devised that cards may be fed into a chute which keeps the card quite flat whilst it is being typed. A ribbon can be used to type on the top of the stencil card which cuts out automatically when the stencil is being prepared. One manufacturer supplies five different models for this work. Another more specialized application is the typing of address cards for the hectograph process. Here a machine very similar to the stencil card typer is used—with a quick feed and



Address Stencil Typewriter.

Automatic Unit Operating a Standard Electric Typewriter and Designed for Correspondence Typing. Addition of a Push Button Control Panel Allows for Automatic Selection of Paragraphs.

automatic alignment for the rapid insertion and typing of the cards. Special rolls of hectograph carbon are, of course, fitted to these machines. Other machines coming along include electric machines for typing Optical Character Recognition (O.C.R.) characters.

5. Automatic

It was some 40 years ago that the first automatic typewriter was introduced. At that time their function was to enable standard types of letters to be individually typed without imposing upon typing staff the monotonous task of manually typing the same document over and over again.

Since then the range of machines and the facilities offered by them has increased enormously, and now there are few typing jobs that cannot be handled by an automatic typewriter, faster, better and at far less cost, than could ever by approached by human effort.

The choice of the best type of machine depends upon many factors—the type of operating medium, how it is produced, the output required, the application itself, *e.g.*, Correspondence typing, report and specification typing, systems typing and computer input.

Some machines are primarily designed for letter writing, others for systems work, while one or two are particularly suitable for revision of Reports, Specifications, etc. Some machines can handle all types of work, but it should not be assumed that they are necessarily the best choice, particularly when considered in terms of flexibility, reliability, ease of operation, output and initial cost.

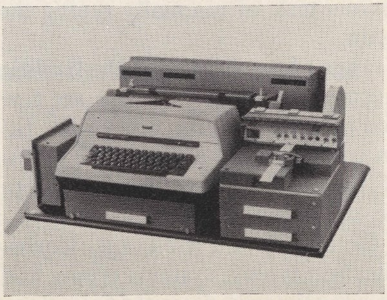
The operating "Master" of an automatic typewriter is usually wide tape, narrow punched tape, edge punched continuous cards, or magnetic tape. In some cases two mediums can be used together for more complex tasks.

Master tapes are prepared either by integral punch units directly from the typewriter keyboard or on a separate punch unit. The choice of "Master" and the method by which it is prepared is directly related to the specific typing requirement. For example, an integral punch unit is essential for Systems Work. Whereas, it is by no means necessary if the prime object is correspondence.

Most automatic typewriters use a conventional electric typewriter. In some cases, any make of typewriter can be used, others have been built around a specific make of typewriter. Typing speed and consequent output of work is in some cases governed by the mechanics of the typewriter, in others by the automatic machine. Typing speed varies from 10–15 characters per second.

Some machines incorporate the facility for the automatic selection of text by the pre-setting of a series of push-buttons on a control panel. This system is particularly useful for correspondence typing as letters can be composed from a series of paragraphs or phrases with personal dictation of special or variable text included as necessary. The use of paragraph selection will often allow the automatic typing of correspondence subjects which at first sight might not appear suitable for automatic treatment.

The key to systems typing is to write data once, record it on tape, store it, update it as necessary, and use it again whenever needed. Many business documents can be prepared from "master" input tapes of standard text, *e.g.*, names, addresses, product descriptions, etc., in conjunction with the manual typing of variables.



A Punched Tape Automatic Typewriter with Comprehensive Editing Facilities.

Facilities exist in most machines for the fitting of two input readers for the integration of two "master" tapes. By-product tapes of all or selected parts of the document can be produced and used as source data for other applications—for typing other documents or for analysis purposes or as input to a computer.

A very useful facility with some machines is the ability to adjust the lengths of lines following the addition or deletion of text. With margin edit control the preparation of Reports, Inventories, Specifications on tape can save many hours of manual re-typing.

Another form of automatic typewriter is the "Tandem" unit where two, three "Slave" typewriters are linked electrically to the master machine. Typing on the Master causes the auxiliaries to reproduce the same material simultaneously so that two or three "top" copies of a document can be produced at once.

6. British Standards

A British Standard is published which specifies certain desirable requirements affecting primarily the efficiency and convenience of standard manual and electrically operated and assisted typewriters. No attempt has been made to specify details of the machine mechanism, attention being focused on those features, the standardisation of which should be of particular benefit to users from the point of view of both ease and simplicity of instruction and operation.

Other standards are also published relating to components parts, electrical safety requirements, radio interference, insulated cables and flexible cords for electric power, etc. Equipment conforming to these standards will be marked accordingly.

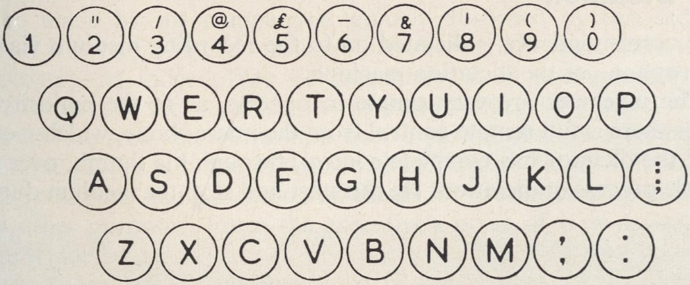
Keyboard Arrangement

The recommended and usual keyboard arrangement is as illustrated. This provides the minimum number of keys and relative positions of standard characters.

In addition, the following special characters are provided. Their positions are catered for by additional keys and by the upper case position on the key at extreme left of the top row.

% percent sign.
? interrogation.
- hyphen.
* asterick.
$\frac{1}{4}\frac{1}{2}\frac{3}{4}$ fractions.

This arrangement might vary with electric typewriters, due to different methods of electric control to obtain repeat mechanism.



Keyboard Arrangement.

CHAPTER 16

Dictating and Recording Equipment

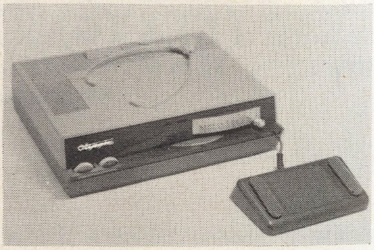
During the years that have elapsed since publication of the last edition of this book, a very great increase in the dictation machine market has taken place in the United Kingdom. So pronounced has this been, in fact, that many office equipment dealers have now found that the dictation machine side of their business accounts for a major part of their total profit and, indeed, some businesses are entirely devoted to the sale of dictation equipment. The shorthand typist who is solely employed in these activities may well spend 40 per cent. of her day either waiting for, or taking, dictation. It should not be forgotten that it is seldom that the executive is able to dictate his letters continuously without interruption from the telephone, intercom, or people entering his office in order to ask questions or engage in discussions. Even in the case where the shorthand typist is engaged on numerous other duties such as filing etc., approximately 20 to 30 per cent. of her time is spent at the dictator's desk, during which time she is completely unproductive. In other words, it requires two people's time for dictation to be given to the shorthand typist. The introduction of dictation equipment means that this unproductive time is completely freed for the performance of other and more important duties.

I. Dictation

The correspondence is dictated on to the recording medium via the microphone of the dictation machine.

The machines are very simple to operate, as in the majority of cases there is full remote control from the microphone, which means that the dictator has complete control, through his thumb, over the whole process of dictation. He can start and stop the medium during

Dictating and Transcribing Machine (Magnetic Disc) Showing Microphone Handset. Mains Operated.


Transcribing Machine (Magnetic Disc) showing Stethoscope Headset and Foot Control. Unit. Mains Operated.

the time of his dictation, and he can also back-space from the control button on the microphone and listen to his own voice in order to refresh his memory as to what has just been said or to collect his thoughts for the next sentence or paragraph. Most machines include facilities for making corrections to the dictation as and when necessary, and, provided that these functions are carried out satisfactorily, the typist will hear a continuous sequence of dictation from her headset during the process of transcription.

2. Transcription

The dictation is subsequently transcribed by the typist using a similar machine or a special transcription unit, both of which are equipped with foot control and stethoscope headphone as accessories. The foot control enables the typist to stop and start the medium at will and also to back-space—that is to say, to move the medium—or sound-head—backwards for a greater or lesser distance in order to listen again to a passage which may not have been quite clear in the first instance, or which she had merely forgotten, perhaps owing to her attention having been diverted. In some machines, a loudspeaker is incorporated within the transcription unit. This enables the typist to transcribe from the speaker as opposed to the stethoscope headset and is useful where the typist or secretary has her own office.

Actual productivity—and this, after all, is what counts so far as the business itself is concerned—is so much greater when the audio-typing method is used that the initial capital expenditure which has to be made by the company is quickly absorbed by this factor. In fact it is very often found that when shorthand typists leave their employers, as indeed they do frequently, it is not necessary to replace them in the same number as that in which they leave.

It will be seen, therefore, that over a period of time a very considerable saving in terms of the shorthand typists' salary will accrue to the company using dictation machines for routine correspondence and other purposes. From the executive's point of view as well, it means that he can dictate at any time to suit himself, and between interruptions which are inevitable in the course of the normal business day. The old adage that time is money is still true and, indeed, has never been so true as it is today.

3. Recording Media

The recording medium may broadly be classified into two types; non-magnetic and magnetic. Each type can be further classified according to the various media used for recording. The basic differences between the two are:—

(1) Non-magnetic media can be used once only. Corrections or notes to the typist are dictated on to the media with reference to this on some form of indicator slip. Alternatively written correction slips are passed to the typist.

(2) Magnetic media can be used over and over again. Corrections can be made by over-recording the previous incorrect dictation, providing the corrected version exactly fits the incorrect one; or where this is not possible, corrections are recorded and reference made to the typist by means of correction marks on an indication slip.

Length of recording time varies according to the medium used. It is appropriate, therefore, to note that the average typist takes about three times as long to transcribe a passage, as is indicated on the medium. Thus a 15 minute recording takes about 45 minutes to transcribe. Under normal circumstances this is a convenient work load for the typist.

Non-Magnetic Media

Recording is carried out by embossing physical modulation grooves on to the medium by means of a stylus. A pick-up or sound head is then passed over the sound track and transforms the modulations into electrical impulses. These are then reproduced into sounds through the headset or loudspeaker. The method is similar to that used for gramophone recording. The media used are:—

Belts: These are made of flexible plastic. Sizes vary, although a typical measurement is 3 in. in width by 12 in. in circumference, providing approximately 200 sound grooves to the inch. Each belt records approximately 1,250 words. The shape provides a uniform recording scale and a consistent quality of recording and reproduction. Playing time is about 15 minutes.

Discs: Made of rigid or flexible plastic, the size varies from 6 in. to 14 in. Unlike a belt, the recording scale varies according to the distance from the centre of the disc. They are usable on both sides, each side giving about 15–20 minutes dictation. Whilst they can be resurfaced, their comparative cost precludes this in practice.

Magnetic Media

The principle of this media is the transforming of sound energy into electrical energy, which is then changed into magnetism. The magnetism corresponds in length and strength to the sound impulse recorded. Thus a permanent record is made of the original sound. Most media uses an iron oxide coating.

As it is necessary for the magnetism to be of sufficient strength for subsequent use, the signal from the recording microphone is amplified prior to its receipt by the recording "head."

Thomas A. Edison
B

Non-Magnetic Recording Belt and Disc showing Recording Grooves.

When playback is required the process is reversed. Magnetism is changed into electrical energy, the impulses are amplified and reproduced through the headset or loudspeaker.

The use of a separate magnetic erasing head enables the whole or any part of the recording to be erased.

The following media are generally used:—

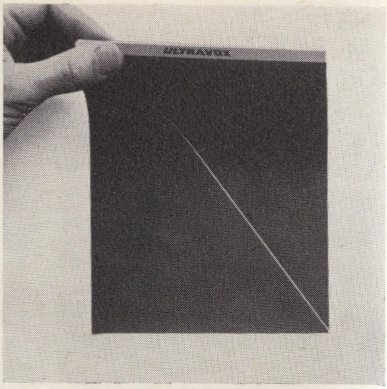
Belt: These are similar in shape and size, etc., to the non-magnetic variety, but made from plastic film or paper similar to magnetic tape. Recording time is about 12 minutes. The media is generally accompanied by an accurately marked index strip. The area of recording can be seen when dictating and transcribing and so location of recorded matter is speedily achieved.

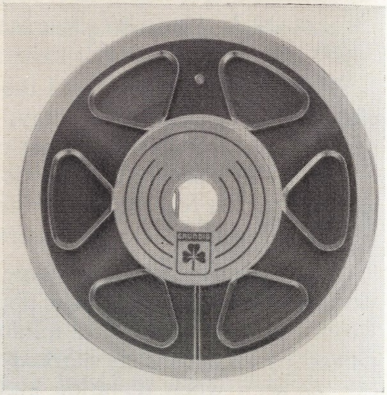
Disc: Made from plastic and sometimes in various colours for distinguishing purposes. Recording time is 10–15 minutes. As with a belt, location of recorded matter by use of an indication slip is quick and simple.

Sheet and Film: Certain machines use this media which is plastic and gives recording times of between 10 minutes and 8 hours. A white line on the uppermost side of the sheet visually indicates movement during recording. Used in conjunction with an indication slip, text location can be pinpointed accurately. Records can also be made in duplicate.

With film, individual letters or piece of dictation can be cut off from the roll and passed to the transcriber for use on that machine. Instructions can be written on the film without damage to the recording.

Tape: This is a plastic or paper ribbon. It is stored on one spool, and automatically rewound on another, after passing through the sound channel where it passes over the erasing and recording (or





(*Top*) Magnetic Belt.
(*Bottom*) Magnetic Disc.

(*Top*) Magnetic Sheet.
(*Bottom*) Magnetic Tape.

The White Line on the belt and sheet is used to visually indicate movement during recording.

playback) heads. Recording and playback movement is at a constant speed. As with other media a time indicator measure enables location of recorded matter.

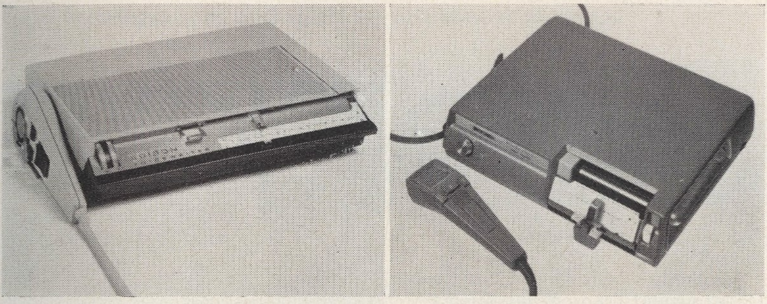
Recording times in the case of tapes most widely used for dictation, varies from 25 to 40 minutes, but of course the time can be as short as required. Tapes can be supplied in cassettes which facilitate loading into the machine.

Wire: At least one machine uses this medium. Spools are available which can give up to 4 hours recording time.

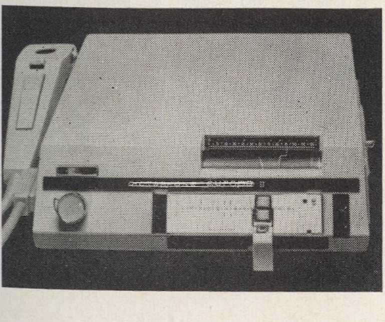
In conclusion of this section it must be said that the various forms of recording media each have their own particular advantage and virtues. To attempt any evaluation of the media described would require more space than is available, in view of the many machines on the market and varying requirements of the user.

4. Machines

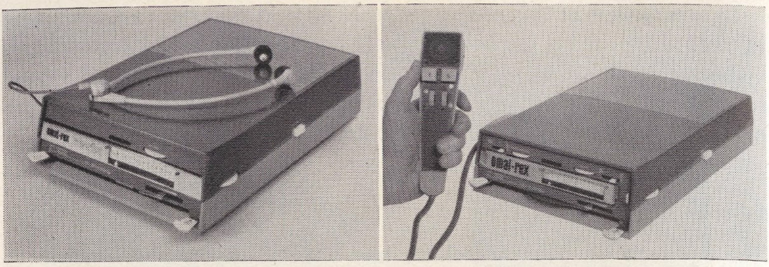
The modern dictation machine has a neat appearance and is of light weight—approximately 7 to 9 lb. It is compact and easily transportable in its carrying case if the executive should wish to take it home for week-end or evening dictation, in order to rid himself of a backlog of correspondence which may have developed during his absence from the office. This function would, however, normally be performed by a portable dictation machine using batteries either dry cell or rechargeable as its power supply. Very convenient types of such portable machines are on the market, the recording medium being, of course, compatible with that of the standard office machine which the typist will use for transcription. The recording medium, whether this be tape, belt, disc, or wire for example, can quite easily be sent through the post for transcription in the office during the time that the executive may be away on business.



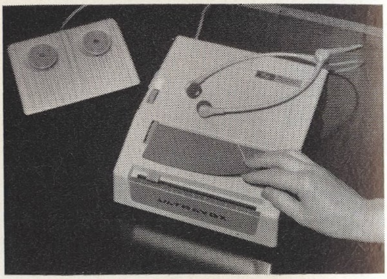
Non-Magnetic Disc and Belt Dictating Machines. Mains Operated.



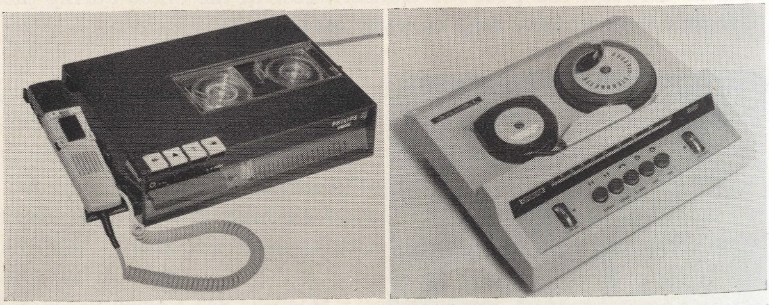
Magnetic Belt Combined Dictating Transcribing Machine. Mains Operated.



Magnetic Disc Transcription and Dictating Units. Mains Operated.



Magnetic Sheet Combined Dictating and Transcribing Machine with Foot Control and Headset. Mains Operated.



Magnetic Tape Combined Dictating and Transcribing Units Showing Cassette and Hand Loading. Mains Operated.

The facilities which should be provided by a modern dictation machine are as follows:

(1) It must be simple to use.

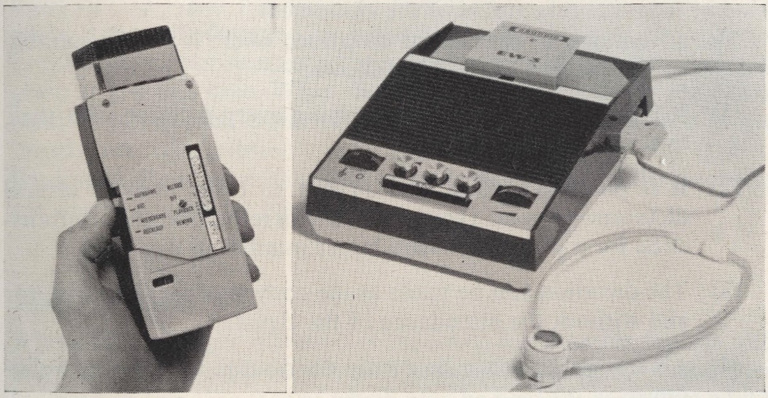
(2) The quality of sound reproduction must be good, and free from background noise.

(3) It should be possible to start, stop record, back-space and correct from controls on the microphone handset.

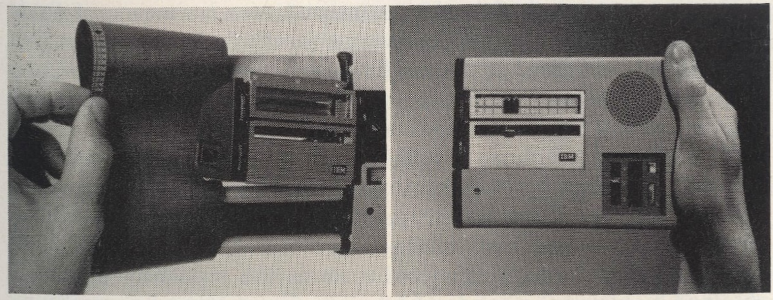
(4) There must be a means of finding any part of the dictation quickly and easily.

(5) It must provide a suitable method of indexing the dictation for reference by the typist.

(6) Other facilities would include devices to record telephone conversations and small conferences or meetings.



Pocket Size Magnetic Tape Dictating Machine and Transcription Unit. Battery Operated.



Pocket Size Magnetic Belt Dictating Machine which can also be used for Transcribing with Headset and Foot Control. Left Hand Illustration shows Insertion of the Belt. Battery Operated.

It must always be remembered that dictation by machine is as much a team effort between dictator and typist as the older system of dictator and shorthand typist, but without expenditure of the latter's time in taking dictation.

5. Centralized Dictation

With this method of dictation, the recording units, transcription units and typists are all located in a central area or "pool," and the typists receive their work via a telephone. The systems are designed to cope with the dictation of low or marginal output dictators. Usually a minimum of six potential users is desirable, for whom the machines would normally be required. However, as other factors, such as existing office routine, general suitability, overall requirements, have to be taken into account, it is advisable that advice is sought from manufacturers of the equipment.

The advantages of centralized dictation, where it can be suitably installed, may be summarised as follows:—

(1) It is not so expensive as supplying every dictator with their own dictating machine.

(2) It is possible for one audio-typist to transcribe for several dictators—several typists would, therefore, be able to transcribe for a proportionately larger number of dictators.

(3) The dictation can be made at the convenience of the dictator and without the attendance of the typist.

(4) All transcribing can be evenly distributed among the audio-typists.

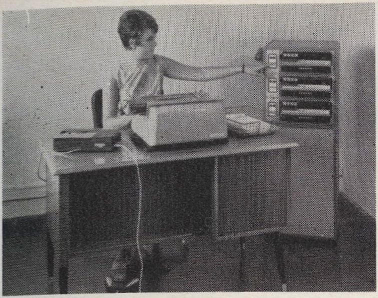
(5) It provides a fast and efficient service.

The dictator is linked to the centralized area by means of PAX or PABX internal telephone systems or by a separately wired independent telephone system. The latter cannot be used for any other communication and thus has the advantage of keeping the ordinary telephone free for conversation purposes.

With internal telephone systems the dictator obtains the use of a recorder by dialling a predetermined number and then controls dictation by single digit dialling, *i.e.*, Dial 1—stop and start, Dial 2—record, Dial 3—short reply, and so on.

In the case of separately wired systems the recording service is obtained by lifting the handset and control of dictation normally by means of push buttons, although a dialling method can be employed.

There are two basic methods of organizing centralized dictation.



Bank System (Magnetic Tape.)

Tandem System (Magnetic Tape).

Bank System

This is the more widely used. As the name implies, the dictation units are located in a "bank" in the central typing area. Each transcription typist has her own transcribing unit which, in many cases, is specially designed for transcription only. This system is more suitable to circumstances where shorter periods of dictation are given at any one time. When the dictation is finished, the recording medium is removed from the dictation machine and placed in the "ready for transcription" rack for transcription by the typists. Bank systems are extremely flexible, as the work from all the recorders are shared equally by the typists.

Tandem System

Where rather longer dictation is required, for example reports and minutes, this system is employed. The installation uses two machines in "tandem form," either of which may be used for recording whilst the other is being used for transcription. Each operator therefore has two recorders/transcribers. This system does not require the recording mediums to be removed from the recorders, and is also admirably suitable for certain "express" letters that may be required. It also provides a more personal service to dictators. Additionally the dictator can first talk to the typist, giving her instructions informing her how much dictation there is etc. to allow her to plan the work.

Irrespective of which method is employed, it is essential that playback and correction facilities are provided. Additional facilities, according to equipment and method, include an automatic or manual "hunting" device to enable the dictator to locate a free machine; a "confidential lock" which prevents a dictator listening to another author's dictation and also ensures against accidental erasure; "call back" arrangements to enable a typist to telephone back to the

An Audio Typing Centre.

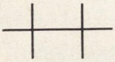
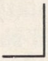
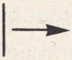
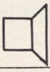
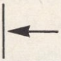
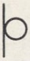
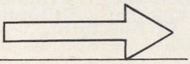
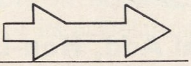
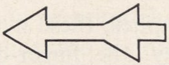
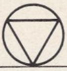
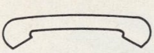
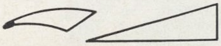
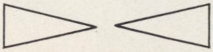
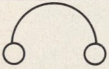
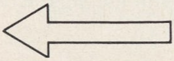
author and play back his dictation—this is particularly useful when technical terms are involved.

Some equipment is voice operated and stops automatically whenever the user pauses and recommences when dictation continues. This allows concentration on the dictation. This equipment also provides a warning signal if the dictator is speaking too softly. It provides too, the typist with a recording free from long gaps, and always above a minimum sound level.

6. British Standards

A British standard has been published for dictating machines. This sets out certain desirable requirements affecting primarily the efficiency and convenience of dictating and transcribing machines in operation. No attempt has been made to specify details of the machine mechanism, and attention has been focused on those features, the standardization of which should be of particular benefit to users from the point of view of both ease and simplicity of instruction and operation. Other standards are also available relating to component parts, electrical safety requirements, radio interference and magnetic tape sound, recording and reproduction, and Post Office requirements concerning telephone recording devices. Equipment conforming to these standards will be marked accordingly.

B.S.I. SYMBOLS

Operation	Letter symbol	Picture symbol	Full word
Instruction or correction	C		Correct
Length of end of letter	L		Length
Playback	P		Playback
Loudspeaker socket	LS		
Dictation*	D		Dictate
Microphone socket	MIC		
Normal forward movement	F		Forward
Fast forward movement	FF		
Rewind† (Fast backward movement)	R		Rewind Return
Stop	S		Stop
Telephone	T		Telephone
Volume	V		Volume
Feed or eject medium			
Headphone	PH		
Backspace	B		Backspace

NOTE. If colour symbols are used, red should be restricted to all recording functions and green to all playback functions.

* If a sensitivity control is provided a numerical progression of 'D's, i.e. D_1, D_2, etc., should be used. The lowest number should be the lowest sensitivity.

† The term 'rewind' should be used for tape and wire dictating machines and the term 'return' for sheet and disc dictating machines.

CHAPTER 17

Adding Machines and Calculators

It is almost impossible today to find any office that is not equipped with an adding machine of one type or another. All accounting and invoicing routines, statistical work, and the infinite variety of jobs involving adding and subtraction of figures necessitates the employment of this piece of office equipment. As the title of this chapter indicates, such equipment can be broadly classified into two groups.

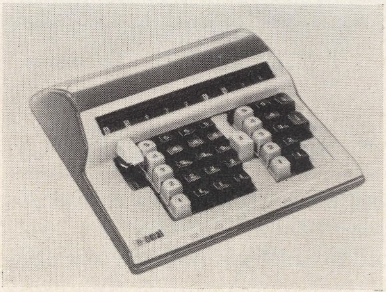
Firstly the adding machine, which is a fairly straightforward item of equipment which can be sold without difficulty through the office equipment retailer.

Secondly the calculator, which is rather more complex and is usually sold only by the specialist dealer or by the manufacturer direct. These machines can perform the basic functions of arithmetic and be used for many types of calculation.

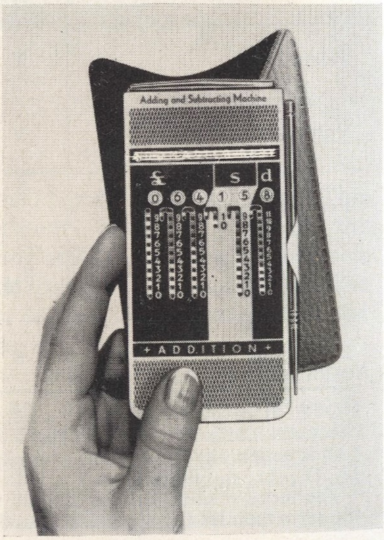
Space does not permit the detailing of all makes and types of machine. Consequently this chapter deals with the subject under the main groups of machine.

1. Manual Add, Non-Listing Machines

As the title implies, these machines are without printing and listing facilities. They are finger-operated, and the depression of the



Above. Manual Add, Non-Lister, Half Keyboard (without Subtraction).



Right. Stylus Operated Adder (Addition one Side—Subtraction Reverse).

appropriate keys causes the amount to be entered into, and accumulated in, an adding mechanism called a "register," its total being given on a dial.

Certain machines have columns of keys numbered only to 5's, and the operator must understand the technique of entering. For instance, a 6 is entered as two 3's, and a 7 as a 3 and a 4.

This type of machine is limited in application because of low entering and totalling capacities and the absence of a subtract mechanism. For checking totals they are useful, but absence of a printed record precludes checking individual items listed, and totals must be transcribed if needed for further use.

Another simple pocket category of machine is available operated by a stylus, and is useful for rapid "on site" calculation.

2. Manual Add/Listing Machines

The add-listing machine—that is, an adding-and-substracting machine in which the amounts entered, and all sub-totals and totals, are printed on a tally-roll—has, in considerable measure, come to supersede the straightforward adding machine. For some purposes the simple adder is sufficient, and it is of course cheaper. But as soon as it is to be used for figure-work in business, the adding machine really needs a printed record of its calculations—a ready-made check on accuracy.

These machines involve the operator in pressing chosen keys and operating a handle to translate the amounts into an internal mechansim which subsequently creates a print register of the amount on the paper roll.

Most manufacturers make separate models, one for sterling calculations and the other for decimal. The better machines will

Above. Manual Add/Listing Machine with Abridged Keyboard.

Right. Electric Add/Listing Machine with Full Keyboard.

also convert from sterling/decimal to whole numbers operation by means of a switch on the keyboard. Variations on the theme are available for specialized work—numerical machines that will calculate in tons, hundredweights, quarters, pounds and ounces, or work in hours, minutes and seconds, for example.

It is important to remember that not all sterling machines feature pence fractions, since their inclusion generally causes the sacrifice of one column of £s.

The most obvious difference between the various makes of add-listing machines is probably in the keyboard layout. The majority have a full numerical layout, following figures as they are handwritten, each key having its own value which does not vary, and where zeros, which occupy 15 per cent. of figure work, are provided automatically.

The other type is referred to as a "simplified" or "abridged" layout, with nine principal entering keys. These are numbered from one to nine, with two further keys for double or triple zero entering. Sterling machines will also have 10d., 11d. and ½d. keys (also ¼d. keys, the latter of some value to certain professions). The illustrations compare the two keyboards.

Opinion varies as to which keyboard provides the faster operation; certainly the keys of the "simplified" keyboards have a lighter touch, and encourage "touch operation."

Differences are very marginal; in the initial stages, the full keyboard is easier to master, as it is so obvious to all persons who may use it, but, to a practised operator, the ability to use "touch" or "one hand" operation has an appeal.

It is worth remembering that some full-keyboard machines can offer only the same number of digits in the totalling capacity as can be registered on the keyboard. This figure is in turn limited by the number of columns of keys that the keyboard will accommodate. Abridged keyboard machines do not suffer from this last drawback and are consequently smaller. They almost all offer one more digit totalling than the entering capacity; some offer more.

3. Electric Add/Listing Machines

Electric machines offer the obvious advantages of greater speed with less effort, as the "pull" handle, necessary after each figure is entered on a hand machine, is eliminated, and a spring-loaded switch, usually called a "motor bar," is substituted. On the other hand, they they are always more expensive, and usually, but not always, less portable.

If an electric machine is considered necessary, it will be found to offer the additional advantage of having a repeat key. This allows for repeat addition, which is so rapid that it can perform a simple method of multiplying. This is particularly so where machines are equipped with both printing mechanism and dials recording totals.

On most machines is to be found a credit balance feature—the ability to subtract a larger amount from a smaller amount, providing a true answer, usually printing in traditional red.

The versatility of a good add/lister can make it such an asset in an accounts department that many makers are now providing versions with carriages for horizontal calculation and front-feed attachments for the insertion of cards and forms, virtually converting them into accounting machines.

Some add/listing machines can also be provided with fitted cash drawers.

Add/listing machines consume paper tally-rolls; this, of course, means that they are good business for the stationer in terms of supplies as well as sales.

4. Calculating Machines

Add/listing machines, whether hand or electric, are very much the stationer's province. The more sophisticated and more expensive calculators, the majority of which are nowadays electric, are less so.

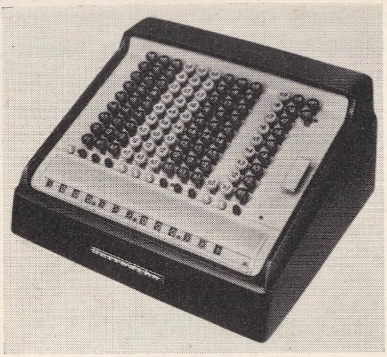
A calculator is a machine which must be able to perform all four arithmetical operations—*addition*, *subtraction*, *multiplication* and *division*. In fact some 200 such machines are on the market at present.

A small proportion of these 200 are not electrically operated. These are of two kinds—key-driven and rotary—but it should be clearly understood that the setting of amounts with a rotary machine may be either by a key or by a lever. Therefore, the term "key-set" should not be confused with the similar term "key-driven." The great majority of hand-powered machines available are rotary, and the description key-set or lever-set refers to the means of entering the factors into the machine.

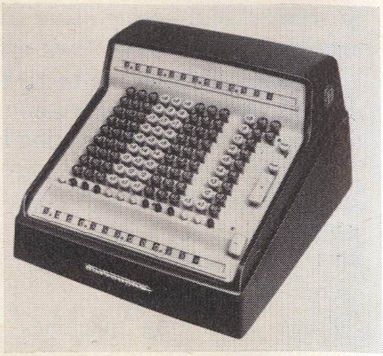
5. Key-driven Calculators

The general keyboard layout of these machines is the same as that for full keyboard add-listing machines—*i.e.*, a series of columns of keys, one for each digit of the adding capacity. The machines differ, however, by not printing the result of a key depression, but instead instantly registering the progressive figures in a sight/dial accumulating register as adding proceeds.

These machines are particularly fast, both because of the immediate registration of figures and because a complete value or amount



Key Driven Calculator (Electric). Results Appear in the Sight Dials. A Touch of the Motor Bar Clears the Machine.



Key Driven Calculator (Electric). The Amounts (Results) from the Working Register (below) are Transferred and Accumulated in the Storage Register (above).

can be depressed in a single operation by means of one or both hands being held on all the appropriate keys together. Training is necessary for an inexperienced operator, but speed builds up rapidly with practice, until the machine can be operated by touch alone.

Addition may be carried out by depressing the appropriate keys and reading off the answer from the dials. However, greater speed is achieved by trained operators, who use the full range of the keyboard only for multiplication and division. In adding, they use the "touch" method and use only the keys value 1–5 in each column. Thus a value of 9 would be expressed by depressing the 4 key followed by the 5 key in the same column. Experience has shown this method, which limits hand travel to a minimum, to give a great increase of speed when touch operating.

The use of these machines for calculating work highlights the fact that multiplication is in fact only repeated addition, and division only repeated subtraction. In both operations, one factor is held on the keyboard and the other introduced by the number of key depressions by the operator. The mechanical and arithmetical sequence need not be the concern of the reader.

Some models of these machines also possess a second adding register. This is used as a store, and can accept results, both additive and subtractive, from the working register. It leaves the working register free for a series of calculations, and avoids the necessity to write down individual results. A duplex machine of this type can save up to 50 per cent. of an operator's time on certain applications, such as calculating invoices.

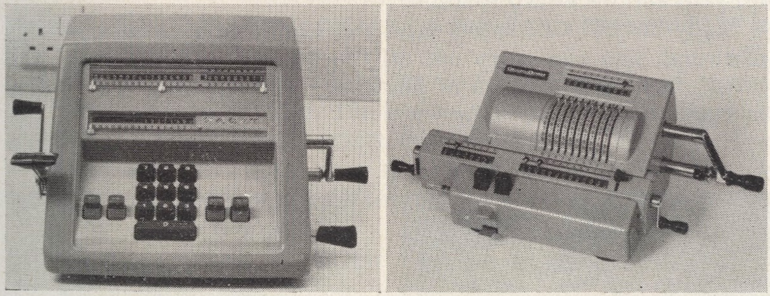
The major use for the key-drive calculator is where a considerable volume of work exists, especially if such work can be centralized into a special department. Typical applications are wages calculations, invoicing, analysis casting (using the machine's high-speed adding ability), stores extensions, pro-rating and cost records.

Both manual and electric models are available, except that the machines with a storage register are available in electric versions only. They are usually sold direct to the user by the manufacturers.

6. Rotary Calculators

Manual

In the case of rotary machines in the *lever-set* category, the act of turning a handle or crank will multiply the number according to the number of turns. To speed operation, the carriage can be moved once to the left for every multiplication by ten. In *key-set* machines, the numbers are entered by key instead of by lever. Some of these machines have full keyboards, and some abridged (or "simplified"). With the latter arrangement, setting can be performed with one hand by pressing the keys with the appropriate digits marked on them in the normal order of writing. If an incorrect digit is entered, however, all the figures set after it have to be cleared and re-set correct from the last entry. With a full keyboard, checking of all entries is simpler and terminal zeros do not need to be registered. This greatly facilitates operation in round figures, but many users consider that the ten or so keys of an abridged keyboard are less confusing and therefore very much easier to master.

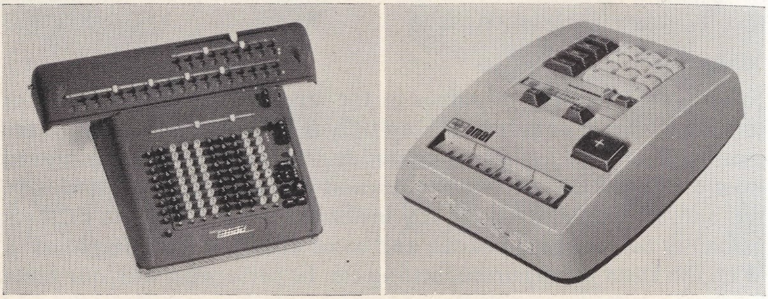


Manual Rotary Calculators.

Key Set Abridged Keyboard. Lever Set with Back Transfer Device.

Electric

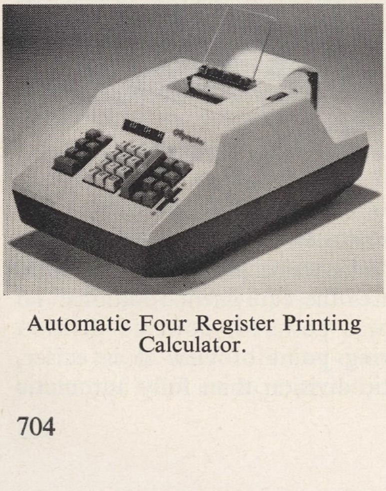
When it became possible to electrify rotary calculating machines, the manual operation of a crank-handle was eliminated. Nowadays, the mere depression of a key ensures the equivalent rotations. To begin with, only multiplication was powered; powered division followed later. From an engineering point of view it is eaiser, however, to provide fully automatic division than fully automatic multiplication. So when a machine is described as semi-automatic, this usually means that it can divide automatically, but that multiplication is done semi-automatically. (Some machines are exactly the other way around, nevertheless.) Machines which can perform both operations without further operator intervention are called fully automatic.



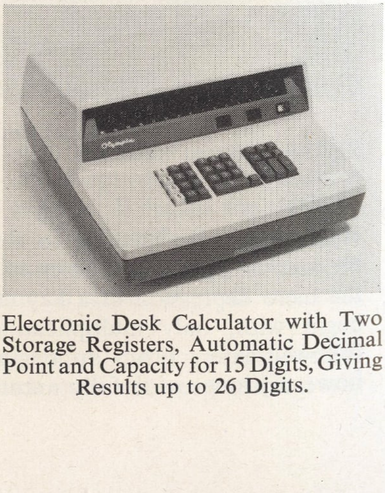
Electric Rotary Calculators.
Fully Automatic, Full Keyboard. Semi-Automatic, Abridged Keyboard.

The main operational difference between these semi-automatic machines and the manual ones is that the main spindle is driven electrically instead of being rotated by a handle, the turns being governed by plus or minus keys which provide, respectively, for forward and backward rotation.

Many electric calculators have the simplified keyboard already discussed, and can carry out all functions of multiplication and division by the depression of one of their greatly abridged number of keys.



Automatic Four Register Printing Calculator.



Electronic Desk Calculator with Two Storage Registers, Automatic Decimal Point and Capacity for 15 Digits, Giving Results up to 26 Digits.

7. Automatic Printing Calculators

The most recent models in the electric calculator range can often carry out all arithmetical functions automatically and list the results and intermediate stages on a tally roll. Most models are provided with both storage and back-transfer facilities. An automatic decimal point system (available on at least one machine) is highly desirable, and essential if results are to be accumulated. Very recently some manufacturers have produced machines which will perform various complex operations—such as evaluation of polynomials—automatically. These machines are able to hold a programme either internally or externally.

8. Electronic Desk Calculators

This type of calculator is extremely fast and silent—calculating time is merely the time taken to touch the operating keys. Results appear almost instantaneously in clear, luminous figures either in a separate register or on a small screen. Silence is an important factor in an open office or where concentration is required.

Most machines of this class have, in addition to the three essential registers, further registers which memorize constant factors and retain intermediate results for further use. The registers of these machines are interconnected to make it possible for results to be transferred to other registers, thus ensuring rapid and error-free operation. A most important point is that, even in involved and difficult calculations, the decimal point will always be found to be in the right place.

Some machines have facilities for up to four additional remote keyboards to be connected. The latest development is an electronic printing calculator which prints the results on a tally roll. The outstanding features of the electronic calculator are extremely high speed, silent operation and self-locating decimal point.

Clearly, the next stage in this survey is to consider accounting machines and electronic computers, and these are dealt with in the following chapters.

9. British Standards

A British Standard is published which specifies certain desirable requirements affecting primarily the efficient and convenient operation of key-driven adding machines, full keyboard add/listing machines and simplified keyboard add/listing machines. It applies to machines which are designed solely for the purpose of adding together and, in some cases, subtracting amounts entered by means of a keyboard, and storing a total in a single recording mechanism. It does not apply to machines having such features as two and multiple registers, automatic carriages and descriptive printing keys, ledger posting machines, typewriters with adding boxes, developments of cash registers, and all attachments such as card and tape punching and reading are excluded.

No attempt has been made to specify details of the machine mechanism, attention being focussed on those features, the standardisation of which should be of particular benefit to users from the point of view of both ease and simplicity of instruction and operation.

Other standards are also available relating to components, electrical safety requirements, electrical performance of tractional horsepower electric motors and generators, radio interference, insulated cables and flexible cords for electric power.

Where equipment conforms to these standards it is marked accordingly.

B.S.I. Symbols

Extracted from the standard is the following table of symbols. One of the appropriate symbols shall be marked on the top of each key controlling the operations listed in the table and one of these symbols shall print on the appropriate operation in the case of those machines with a printing facility. If a symbol is provided for addition, a plus sign shall be used.

Operation	Letter symbol	Picture symbol	Full word
Total	T TOT	✱	Total
Credit Balance Total	TOT (on key) CR (printing)	✱c $\frac{\ast}{\ast}$ – ✱ ✱ – Θ	
Sub-total	S or ST (on key) S (printing)	◊ □ ●	Sub total
Non-add	N NA	< # ◁	Non add
Subtract		–	
Credit-Sub-Total	ST (on key) CR (printing)	□c $\overline{\Diamond}$ –● ◊– $\underline{\Diamond}$	

CHAPTER 18

Mechanized Accounting

Book-keeping and accounting equipment for mechanized systems forms an important part of the office supplies and equipment market. Over the past ten years the investment in this part of the market has increased considerably. Businesses have sought to increase their efficiency by reducing the time, labour and effort involved in book-keeping and accounting processes. It is reasonable to assume that this market will continue to expand and, because it is one in which the stationer has a definite interest, it is necessary that he should at least have a general knowledge of the subject.

The stationer's interest in this market is both direct and indirect. He is directly concerned because certain types of equipment will be handled by the stationer himself. On the other hand, some of the equipment is handled directly only by the manufacturer. In such a situation the stationer should be in a position to give general advice to his client and to suggest a supplier to him. Some suppliers are prepared to pay an introductory commission for business received in this way. In fact, frequently the latter can be more profitable for the stationer than the direct sale because the overall selling costs for this type of equipment can be very high.

Mechanized accounting was at one time considered by large businesses only. Small businesses tended to think of it as being unsuitable for them, because of their size and the capital cost involved.

Today, management in businesses of all sizes looks to mechanization as a method of reducing costs and increasing efficiency to help to combat increasing competition from business rivals. The increasing difficulty in recruiting and keeping staff of sufficient quantity and quality to maintain a hand-written book-keeping/accounting system has also made businesses turn to mechanization as a possible solution to the staff shortage.

Manufacturers of mechanical accounting equipment have realized these problems and have been quick to develop machines for the smaller business, with a great deal of success.

1. Electromechanical Machines

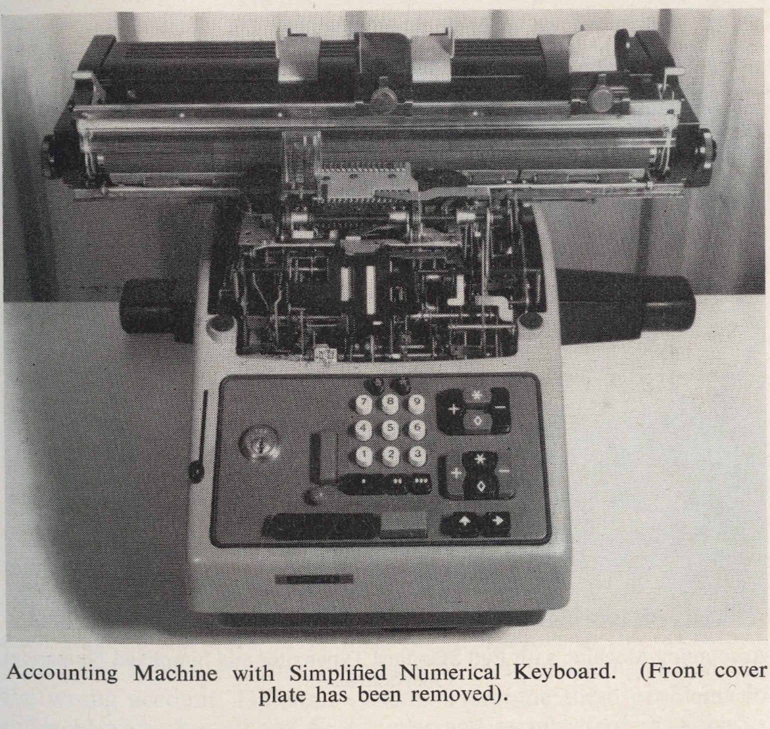
Book-keeping and accounting machines developed along two lines:—

(1) Typewriter based;

(2) Adding machine or calculator based.

Earlier generations of machines showed clear traces of their origins, but today very few machines developed from typewriters are in production. This is due to the basic limitations inherent in this type of machine. Even the elementary functions of adding, subtracting, sub-totalling and totalling in full are difficult to incorporate. Machines developed from adding/calculating machines had no such limitations and their development has continued steadily.

A distinction has been made between "book-keeping" and "accounting" machines. The terms are used rather loosely in connexion with machine accounting, but it is generally accepted that "book-keeping" refers to the smaller type of machines dealing, for example, with simple ledger posting and that "accounting" applies to the more versatile type of machine capable of carrying out more complex accounting routines.



Accounting Machine with Simplified Numerical Keyboard. (Front cover plate has been removed).

Features of the Machine

Machines are capable of preparing several related forms simultaneously—*e.g.*, journal or audit sheet, ledger account and statement.

They are equipped with a movable carriage, which often is fitted to move in a shuttle fashion, and equipped with mechanisms to give vertical totals and sub-totals and total and sub-total cross-casts.

These mechanisms are called **Registers**, and the number will vary with the requirements of the buyer and the range of machines made by the supplier.

There is a wide range of machines available, from simple wide-carriage back-feed machines similar in appearance to a simple adding machine, to those with long dual-feed carriages with multiple banks of registers.

The main features of an accounting machine are:—

(1) Dual-feed carriage, with or without programmed automatic opening and closing of the front feed at selected points. The front feed(s) on many machines can also be controlled manually or electrically to insert the ledger card and statement, the machine automatically selecting the next writing position on the front-fed document(s);

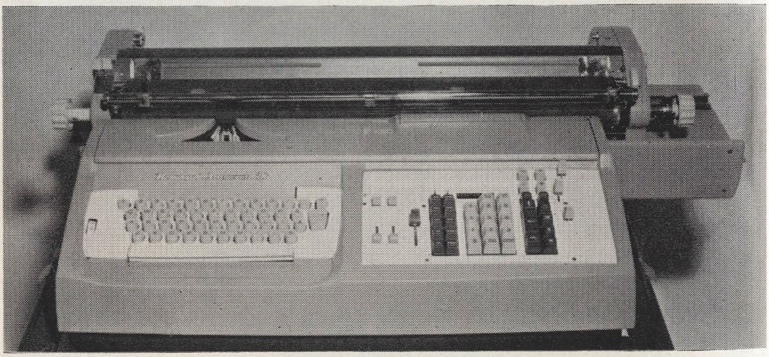
(2) Automatic or variable date printing;

(3) Automatic or variable character symbol printing—*e.g.*, GDS, CR, CSH, JNL, TFR, etc.;

(4) Automatic printing of amounts entered on keyboard;

(5) Automatic computation of vertical sub-totals and totals;

(6) Automatic computation and printing of sub-balances and balances.

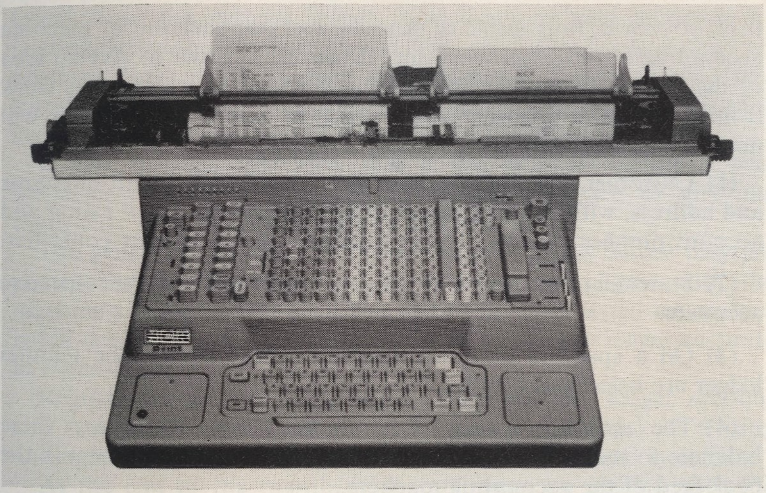


Accounting Machine with Full Standard Typewriter and Simplified Numerical Keyboards.

Machines are available with or without a typewriter, and with or without symbols for descriptive references or a combination of both.

The operator can set up on the figure keyboard such items as symbol designations, date, folio reference and amount and, at a single depression of the electric motor bar, the machine automatically moves into the correct column and prints the complete information without further effort on the part of the operator.

As with adding machines, there are two types of keyboard—the full and the simplified—and many points are similar to both adding and accounting machines. Irrespective of the type of keyboard used, the factor of major importance is what happens after the figures have been entered on the keyboard. The mathematical processes, tabulating to the correct positions for successive operations and printing the new balances on the accounts are all performed automatically. The number of automatic functions is the major factor in reducing the time taken to process accounts on a machine system, but this reduction is of no great benefit if the accuracy of the work suffers. It is possible that a machine system may introduce new sources of error (*e.g.*, entering the existing ledger balance) which may not arise with a hand-written system.



Accounting Machine with Full Standard Typewriter and Full Numerical Keyboards. A guard is shielding the "Tens" column for the machine to operate in £ s d.

However, any well-designed system contains methods of proving each stage of the work performed—*e.g.*, bringing to the operator's notice any balance incorrectly entered or even an attempt to post to the wrong account. Different systems overcome these problems in different ways, but all aim to discover and rectify errors as soon as possible.

Control accounts are maintained to prove the overall accuracy of the work performed, and, usually once a month, the ledger balances are extracted and reconciled with the control accounts.

The underlying principle governing the automatic functioning of the machine is a component variously called the "control plate", "program bar," "program panel," etc., according to the description used by the manufacturer.

This component is made to the special requirements of the user. It is secured to the machine by various methods, but most are capable of quick interchange by the machine operator.

On some machines these control bars are four-positional, enabling four different applications to be performed with minimum interference with the work. These four applications could be sales ledger (debits), sales ledger (cash), wages and P.A.Y.E. records, and stock ledger. It is also possible on a single control bar to program it in such a way that more than one application can be catered for.

2. Operation of the System (Sales Ledger)

It is, of course, impossible to describe *every* application of machine accounting in the space available. However, in order to give an idea of the general operation, the routine involved in transferring work from a *manually prepared sales ledger to machine accounting* will now be described.

(1) Customer accounts cards or sheets are headed with the name and address, with other appropriate details such as credit rating and account number, and housed in a ledger tray or similar container.

(2) Statement forms are also prepared and filed with the respective accounts.

(3) On a specified date, outstanding balances from the manual ledger are listed and totalled.

(4) The machine system is commenced by transferring these balances to the new cards and statements, with a journal sheet in the back-feed of the accounting machine.

(5) When the operation is completed, the following results will obtain:—

(*a*) All accounts will show the last balance due from the customer, with date of transfer;

(*b*) Grand total of all balances, automatically totalled by the machine;

(*c*) Journal sheets giving permanent condensed records of all balances transferred.

(6) To establish accuracy of transfer, the machine figure is checked against the total balance figure of the manual ledger, and, on agreement, is posted to a machine sales ledger control account which is normally filed with the personal accounts ledger.

(7) The sales ledger is now ready for machine posting.

(8) Sales invoices are sorted in the same sequence as the ledger accounts—*i.e.*, alphabetically, numerically, etc. They are then listed for a "check" figure.

(9) The operator enters details of date, reference number and amount on the affected accounts, the machine computing the addition of the previous balance and invoice amount and printing the new balance in the "balance due" column on the stationery.

(10) At the end of the posting "run", the machine automatically prints an accumulated total of all invoices which, on agreement with the separate check figure previously obtained, is posted to the control account.

(11) The *Control Account* is a very important part of the new system. The account was opened with the total of balances transferred from the manual ledger. This figure is now increased by posting the total of invoices posted. This procedure is adopted for all postings through the ledger—*i.e.*, invoices, credit notes, cash, transfers—and at any moment the control account shows the total amount outstanding over all accounts in the ledger.

It will be seen, therefore, that if the purchase ledger is also mechanized there is easy and immediate reference to give the up-to-date total of sundry debtors and creditors.

The general principle is to pre-list all documents before they are posted through the machine and to agree that figure with the machine's automatic total of the entries made so as to maintain a batch document check, localize errors and keep the ledger accurate in every detail.

Regular proved entries by the machine to both ledger account and statement eliminate month-end peaks and the task of writing and agreeing statements as is necessary under a manual system.

At the end of the month, new statements are headed with the current balance of the statement sent to the customer. Again the machine accumulates the total, which must agree with the total outstanding in the ledger shown in the control account.

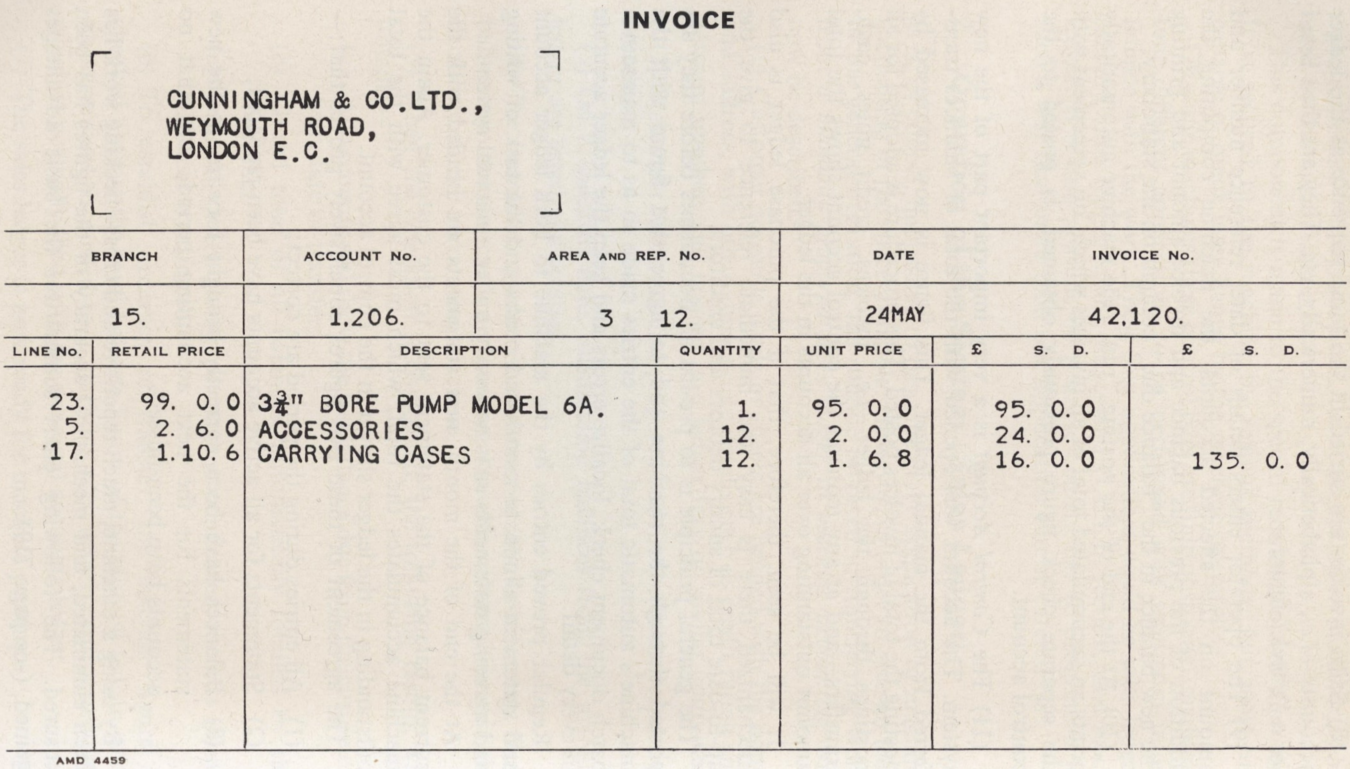
The agreement of these two figures conclusively proves that:—

(1) All entries during the period are correct;

(2) Statements for all active accounts have been rendered;

(3) Balances have been correctly brought forward to the new statements for the next accounting period, and that no accounts have been missed.

By using a machine, much repetitive and cross-checking work has been eliminated, and mechanical accuracy of the figures has been ensured. The following chart summarizes the basic advantages gained, (see page 719).



INVOICE

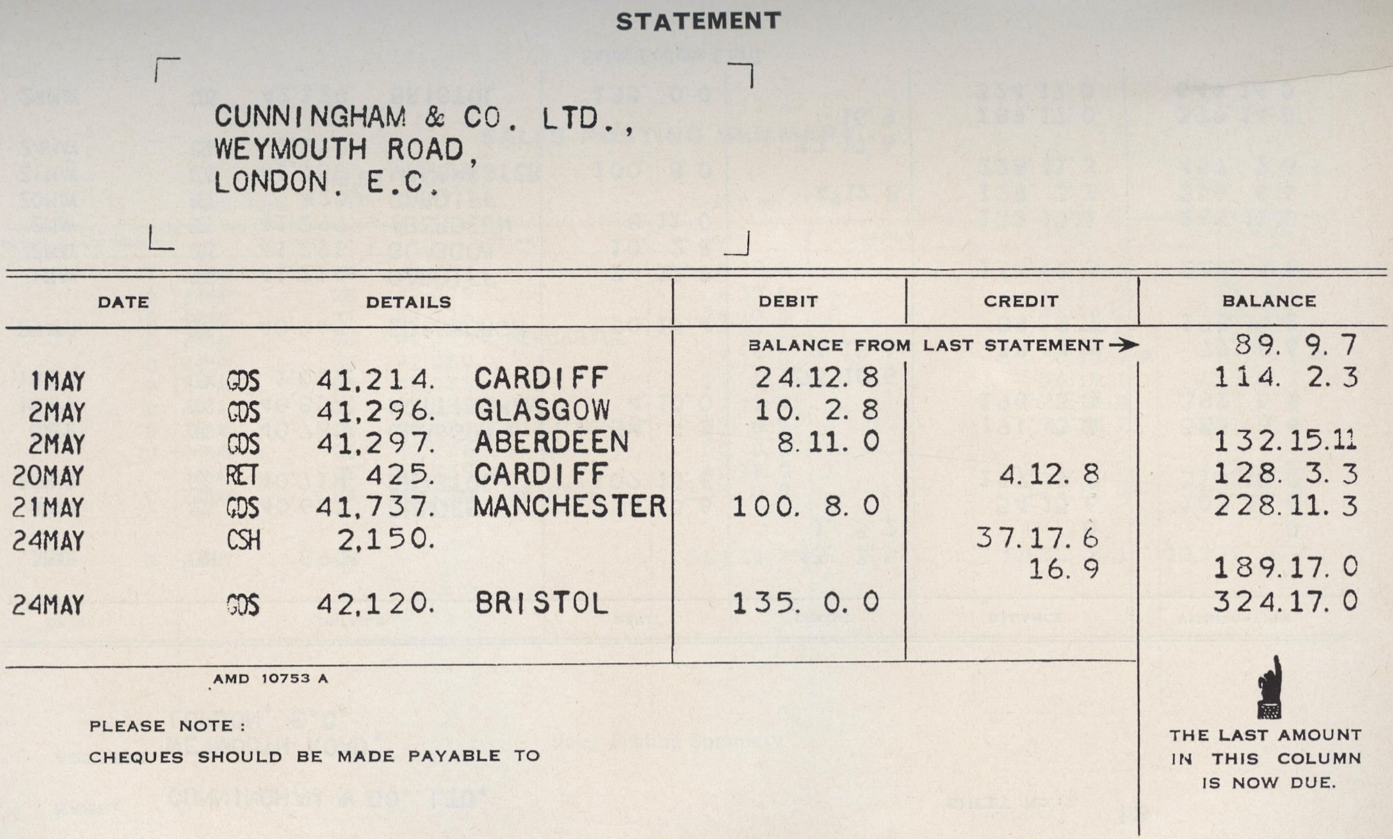
CUNNINGHAM & CO.LTD.,
WEYMOUTH ROAD,
LONDON E.C.

BRANCH	ACCOUNT No.	AREA AND REP. No.	DATE	INVOICE No.
15.	1,206.	3 12.	24MAY	42,120.

LINE No.	RETAIL PRICE	DESCRIPTION	QUANTITY	UNIT PRICE	£ S. D.	£ S. D.
23.	99. 0. 0	3¾" BORE PUMP MODEL 6A.	1.	95. 0. 0	95. 0. 0	
5.	2. 6. 0	ACCESSORIES	12.	2. 0. 0	24. 0. 0	
17.	1. 10. 6	CARRYING CASES	12.	1. 6. 8	16. 0. 0	135. 0. 0

AMD 4459

Sales Invoice.



STATEMENT

CUNNINGHAM & CO. LTD.,
WEYMOUTH ROAD,
LONDON. E.C.

DATE	DETAILS	DEBIT	CREDIT	BALANCE
		BALANCE FROM LAST STATEMENT →		89. 9. 7
1MAY	GDS 41,214. CARDIFF	24.12. 8		114. 2. 3
2MAY	GDS 41,296. GLASGOW	10. 2. 8		
2MAY	GDS 41,297. ABERDEEN	8.11. 0		132.15.11
20MAY	RET 425. CARDIFF		4.12. 8	128. 3. 3
21MAY	GDS 41,737. MANCHESTER	100. 8. 0		228.11. 3
24MAY	CSH 2,150.		37.17. 6	
			16. 9	189.17. 0
24MAY	GDS 42,120. BRISTOL	135. 0. 0		324.17. 0

AMD 10753 A

PLEASE NOTE :
CHEQUES SHOULD BE MADE PAYABLE TO

☝ THE LAST AMOUNT IN THIS COLUMN IS NOW DUE.

Sales Statement.

SALES LEDGER

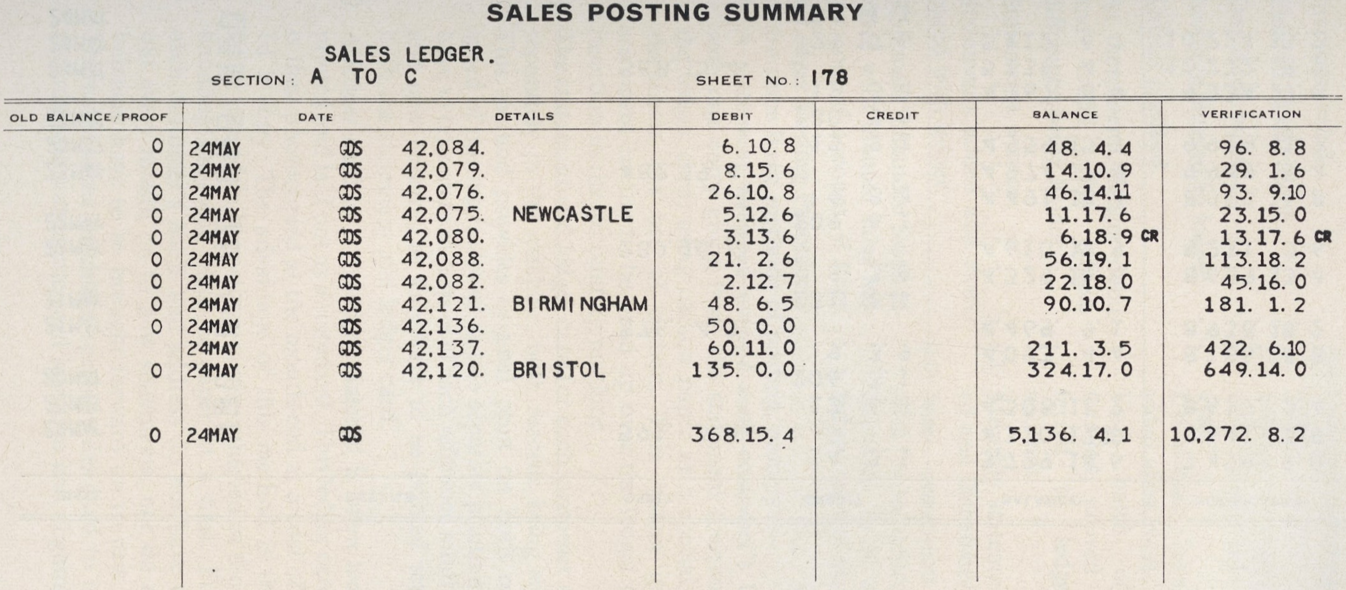
NAME: CUNNINGHAM & CO. LTD.

SHEET No.: 13

ADDRESS: WEYMOUTH ROAD,
LONDON, E.C.

DATE	DETAILS	DEBIT	CREDIT	BALANCE	VERIFICATION
3MAR	CSH 897.		43. 3.5		
			1. 5.2	0	0
4MAR	GDS 40,667. DUNDEE	54.15.6		54.15.6	109.11.0
23MAR	GDS 40,714. BRISTOL	102.13.6		157, 9.0	314.18.0
8APR	GDS 40,787. GLASGOW	34. 4.3		191.13.3	383. 6.6
16APR	GDS 40,854. NOTTINGHAM	4.10.0		196. 3.3	392. 6.6
18APR	CSH 1,022.		153.10.6		
			3.18.6	38.14.3	77. 8.6
25APR	GDS 40,965. EDINBURGH	50.15.4		89. 9.7	178.19.2
1MAY	GDS 41,214. CARDIFF	24.12.8		114. 2.3	228. 4.6
2MAY	GDS 41,296. GLASGOW	10. 2.8			
2MAY	GDS 41,297. ABERDEEN	8.11.0		132.15.11	265.11.10
20MAY	RET 425. CARDIFF		4.12.8	128. 3.3	256. 6.6
21MAY	GDS 41,737. MANCHESTER	100. 8.0		228.11.3	457. 2.6
24MAY	CSH 2,150.		37.17.6		
			16.9	189.17.0	379.14.0
24MAY	GDS 42,120. BRISTOL	135. 0.0		324.17.0	649.14.0

Sales Ledger Card.



SALES POSTING SUMMARY

SALES LEDGER.
SECTION: A TO C
SHEET No.: 178

OLD BALANCE/PROOF	DATE	DETAILS	DEBIT	CREDIT	BALANCE	VERIFICATION
0	24MAY	GDS 42,084.	6. 10. 8		48. 4. 4	96. 8. 8
0	24MAY	GDS 42,079.	8. 15. 6		14. 10. 9	29. 1. 6
0	24MAY	GDS 42,076.	26. 10. 8		46. 14. 11	93. 9. 10
0	24MAY	GDS 42,075. NEWCASTLE	5. 12. 6		11. 17. 6	23. 15. 0
0	24MAY	GDS 42,080.	3. 13. 6		6. 18. 9 CR	13. 17. 6 CR
0	24MAY	GDS 42,088.	21. 2. 6		56. 19. 1	113. 18. 2
0	24MAY	GDS 42,082.	2. 12. 7		22. 18. 0	45. 16. 0
0	24MAY	GDS 42,121. BIRMINGHAM	48. 6. 5		90. 10. 7	181. 1. 2
0	24MAY	GDS 42,136.	50. 0. 0			
	24MAY	GDS 42,137.	60. 11. 0		211. 3. 5	422. 6. 10
0	24MAY	GDS 42,120. BRISTOL	135. 0. 0		324. 17. 0	649. 14. 0
0	24MAY	GDS	368. 15. 4		5,136. 4. 1	10,272. 8. 2

Sales Posting Summary.

SALES LEDGER

NAME: CONTROL ACCOUNT   SHEET No.: 47

ADDRESS: A TO C

DATE	DETAILS	DEBIT	CREDIT	BALANCE	VERIFICATION
			14. 3. 1	3,729. 14. 6	7,459. 9. 0
20MAY	GDS	591. 3. 4		4,320. 17.10	8,641. 15. 8
20MAY	RET		12. 6. 8	4,308. 11. 2	8,617. 2. 4
20MAY	CSH		206. 3. 1		
			9. 3. 9	4,093. 4. 4	8,186. 8. 8
21MAY	GDS	376. 4. 9		4,469. 9. 1	8,938. 18. 2
21MAY	CSH		131. 8.11		
			8. 3. 6	4,329. 16. 8	8,659. 13. 4
22MAY	GDS	280. 16. 1		4,610. 12. 9	9,221. 5. 6
22MAY	CSH		109. 6. 1		
			9. 8. 4	4,491. 18. 4	8,983. 16. 8
23MAY	GDS	482. 19. 4		4,974. 17. 8	9,949. 15. 4
23MAY	RET		15. 2. 1	4,959. 15. 7	9,919. 11. 2
23MAY	CSH		180. 3. 6		
			12. 3. 4	4,767. 8. 9	9,534. 17. 6
24MAY	GDS	368. 15. 4		5,136. 4. 1	10,272. 8. 2
24MAY	RET		23. 17. 6	5,112. 6. 7	10,224. 13. 2
24MAY	CSH		294. 1. 3		
			7. 6. 2	4,810. 19. 2	9,621. 18. 4

Sales Ledger Control Account.

Manual	*Machine*
(1) Invoices sorted. (2) Entered in day book. (3) Day book added. (4) Invoices entered in ledger. (5) Entries checked. (6) At month-end, ledger debit and credit sides added, difference being balance. (7) Statements written. (8) Statements added and compared with ledger. (9) Statement balances listed to agree with manual sales ledger control account, if kept.	(1) Invoices sorted and listed for total. (2) Journal, accounts and statements prepared simultaneously. Up-to-date balances provided after every entry. Each batch of postings totalled, proved and transferred to ledger control account. (3) Monthly statements extracted and dispatched. (4) New statements prepared with simultaneous list of balances. Total agreed with ledger control account.

Sales Ledger Posting Procedures

There are three basic methods of posting, namely:—

(*a*) A statement wrapped around each customer's ledger card with one entry going from the statement (original print) to the ledger card, using carbon paper or a special paper that eliminates the use of carbon. This system involves the statement having to be lined up over the ledger card before insertion in the accounting machine.

(*b*) The statement and ledger card for each customer are inserted separately in the machine, both records being side by side. This method provides original print on both records, but speed of posting is slower as two separate printing operations have to take place in respect of each reference number, amount and new balance, as they have to be printed separately on both the statement and ledger card.

(*c*) A ledger card of translucent material is often used which is printed and laid out as a statement. This ledger card statement is then photocopied at the month-end at a cost of less than a 1d a copy. The advantage of this method is that a much faster rate of daily postings can be achieved as the operator is handling only one piece of paper at a time. Furthermore, each customer's name and address do not have to be typed out every month on to new statements, nor do outstanding balances have to be brought forward on to new statements. There are some machines specially designed to handle such records with automatic card insertion and alignment.

Advantages of Mechanization of Accounts

The advantages of mechanizing ledger posting can therefore be summarized as follows:—

(1) *Greater Accuracy*

Every batch of entries made through an accounting machine is controlled for accuracy and therefore all accounts are in proved, perpetual balance at all times, both individually and in total. A trial balance can be taken out merely by listing the ledger accounts individualy, the total of which must agree with the relative control accounts.

(2) *Elimination of Transcription Errors*

As all related records, such as a ledger account, a customer's statement and a cash summary and day book sheet, are all entered simultaneously at the one operation, all dangers of any transcription error from one record to another are eliminated.

(3) *Automatic Adding and Subtracting*

The use of a machine for all computations reduces manual errors and lessens staff fatigue. Machine operators can maintain regular output for sustained periods with a high degree of accuracy.

(4) *Speedy Dispatch of Statements*

As all statements are being built up automatically with day-by-day entries during the month when making entries to the ledger, statements are ready for immediate dispatch at month-end without the month-end preparation bottleneck involved with most manual methods. Thus, statements are sent out quickly, and this helps towards quicker payments.

(5) *Use of Control Accounts*

With the use of control accounts an immediate overall view of the business is always instantly available to management.

(6) *Speed of Operation*

Long runs of repetitive work can be performed much more quickly by machine than by hand.

(7) *Economy of Staff*

In addition to effecting a possible reduction in the number of staff required for routine accounting work, the use of machines enables a less expensive and more junior type of staff to be utilized with confidence and reliability.

(8) *Additional Information*

With very little extra machine work it is very easy to provide additional information to management, such as a turnover balance for each customer or an account age analysis, etc. With manual systems, the provision of such additional information could involve much time and effort.

3. Other Applications

Space does not permit the detailing of all applications and routines, that can easily be operated by mechanised accounting. However, a few short notes will be of interest to emphasise the versatility of the machines.

Purchase and Nominal Ledger: On smaller types of machine these two applications would be dealt with as separate jobs, but larger accounting machines are capable of preparing both ledgers on a side-by-side basis.

Analysing: Most analysis problems are overcome by the use of separate columns for each heading required. Machine accounting techniques allow a choice of method. Separate ledger cards for each heading form a popular system; another is press-button analysis but this can be expensive since flexibility relies on the high-cost, multi-register accounting machines.

Cash Book Procedures (Receipt and Cheque writing): Receipts may be written simultaneously with the posting of cash received to the sales ledger. Cheque writing on accounting machines is reduced to a spare-time operation. On some machines, automatic controls calculate and print the cheque number, and even provide a special protection sign to print behind the pounds for security purposes.

Payroll: Universally accepted as a difficult problem, wages preparation may be handled in a number of ways. The advent of electronic accounting machines has enabled advanced techniques to be employed so that the machine operator has only a minimum of work.

Stock Control: A ledger card for each stock line is maintained, showing a balance of stock in hand. This may be held in quantity, in sterling value, or both. A further sophistication would be the provision of warnings, given by the machine, when stocks fell below a minimum level.

Job Costing: In machine accounting terms, most costing operations may be translated into basic analysis procedures. One method would be to open a card for each job, having columns for each of the elements of cost. A total-cost column would show the progressive cost-to-date figure.

Invoice and Sales Accounting: The electronic era has revolutionised this particular application. Invoices are calculated line by line and totalled. Discounts, etc., may be applied automatically at electronic speeds and the final net total is simultaneously transferred to an account card and statement held in the machine. From here, the updating of the account is entirely automatic and a completely accurate operation.

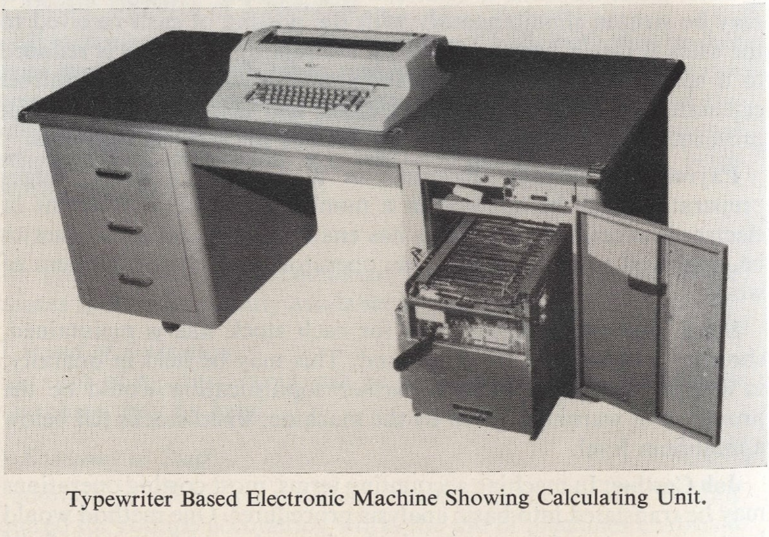
Hire Purchase: The system involved varies considerably with individual requirements. However, the age-old problem of arrears control and large-volume posting of cash receipts may be dealt with by machine in a more satisfactory way. The speed and accuracy of machines are the main criteria in overcoming the complex problems of this application.

4. Electronic Machines

As has been stated previously, machines for mechanised accounting are in continuous development, both in design and application. Electronic machines, like electromechanical machines have developed along similar lines

(1) Typewriter based.

(2) Accounting machine based.



Typewriter Based Electronic Machine Showing Calculating Unit.

Typewriter Based

As one would imagine, these machines have the appearance of a standard typewriter with, in most cases, additional controls to govern arithmetical functions. These were designed primarily as invoicing machines to simultaneously produce and extend an invoice set. All calculations of any type (quantity, weight, etc.) are completely automatic. Discounts, surcharges and purchase tax present no problems, and totals of the days invoices may be provided.

The invoice set is normally rear fed as with a normal typewriter, and the name and address, quantity, description, and unit price, typed in the normal way. From this point on, the machine takes over and calculates and prints, on to the invoice in the appropriate columns, the item extension. Each item is treated in the same way, and at the end of the invoice the machine produces a total. Apart from speed, of course, an important factor here is the absence of any copying operation of the calculated figures.

Most machines too, can be used in conjunction with punched tape or cards. This particular facility enables the descriptive matter to be fed into the machine, and typed on to the invoice automatically. The process can be carried to its limit, so that the only information which the typist enters is the actual quanity delivered. Such practice does, however, necessitate the keeping of files of punched cards representing, for instance, customers names and addresses, product description and so on.

The machine can also be made to punch cards or tape as an automatic by-product of the invoicing operation. These can then be processed through a computer installation, or bureau, as required.

Accounting Machine Based

Electronic accounting systems have now been developed to give "small computer" performance. A desk-size machine may have unlimited flexibility, combining punched-tape programming, magnetic ledger card records, and an expandable magnetic disk memory.

Accounting Machine Based Electronic Machine.

Program tapes, in loops or strips, are read by a photo-electric reader, and programs are changed simply by removing one tape and inserting another. Such machines operate at millisecond speeds. Punched cards and paper tape peripherals are also available.

These machines can handle invoicing, costing, hire purchase, stock records, production scheduling, payroll, etc., and provide practical automation for every kind of business.

5. Decimalization

Most machines are now designed to handle both £ s. d. and the future U.K. £ p. decimal currency. In some machines, the change from £ s. d. to £ p. working is achieved by a switching device; others have built-in conversion features which will allow a simple changeover to decimal working when the new currency is introduced in 1971. This changeover will be carried out free of charge after "D" Day and will eliminate the presence of unnecessary keys and levers, when the machine is converted to decimal operation.

Hence, both types of machine can be used for £ s. d. at the present time and for decimals when changeover comes. Machine capacities are unaffected by currency change; £ capacity remains the same.

The switch-type machines have special-purpose keys which provide for the new halfpenny or tenpence and elevenpence in £ s. d. Full-conversion machines have the irrelevant £ s. d. keys removed when the mechanical change to decimal working is carried out.

While switch machines may not require modification, full-conversion machines will be changed over very quickly, and on site in the vast majority of cases, without disruption to normal working.

It will, of course, be advantageous for companies to convert certain of their internal records to decimal before "D" Day. The anticipated date of changeover is February, 1971; as many companies start their financial year on 1st January, the benefits of keeping internal records in decimal from the start of 1971 are obvious.

Business stationery will require two columns (£) and (p.) instead of the existing three columns for £ s. d. Stationery supplies should, therefore, be considered well before the changeover date.

6. Ancillary Equipment

The successful installation of an accounting machine depends very much on correct housing equipment and the design of stationery used.

The accounting machine expenditure is normally a one-time expense over a long period, but equipment can be expanded and stationery is expendable. It is therefore in the interests of the stationer to familiarize himself with the various products and ideas that are on the market.

Stationery

Broadly speaking, machines are required to print on to:—

(*a*) Paper, which can either be single or in multiple copies according to the system in use, for invoices and statements.

(*b*) Card, for ledger records.

In a handbook of this description it would be impossible to describe all the features one should look for in designing the stationery and the qualitative aspects of the paper.

The design of such stationery is a matter for the machine stationer and the manufacturers, and will also be governed by the particular needs of the installation. Here again, the stationer will be frequently called upon to handle the actual order, so at least a working knowledge of the subject is vital. Where a statement, ledger card and proof sheet are produced simultaneously, exact registration of the forms is vital. Qualities of paper and card, and cutting the correct way of the grain, are all factors making for efficiency.

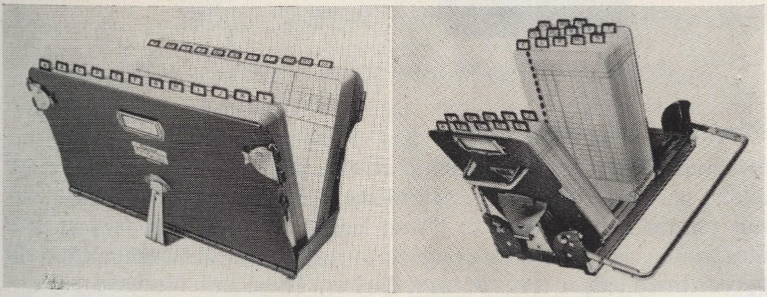
To-day there is a wide range of coated papers available which render carbon papers obsolete. However, carbon paper and carbon jackets (*e.g.*, for journal sheets and payroll sets) are preferred in many cases and provide a further source of business for the stationer. Further comment will be found in the chapter on Continuous Stationery.

Binders

There is a variety of binders with self-locking devices. When not in actual use the sheets are firmly held together in the same fashion as a bound book.

When in use, the account sheets are freed from the binder covers, leaving the sheets loose for extraction and posting to a machine and re-insertion into the ledger.

There are variations in the construction of these loose leaf binders, but one typical method allows the ledger to be placed in an



Examples of Posting Trays.

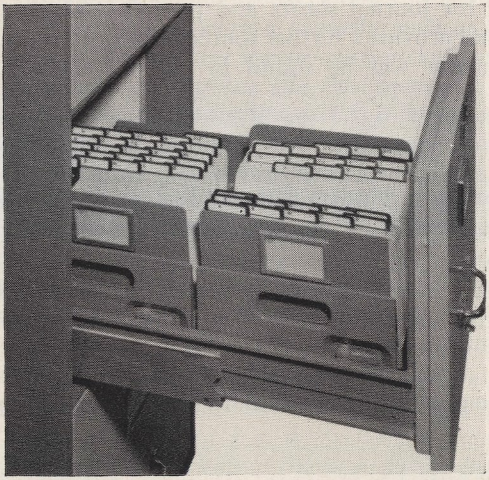
operating table at the correct height for the machine operator. A lever is built into the stand which expands the binder and frees the ledger sheets for use.

Ledger Card Trays

Cards are placed loose in a steel tray and separated with dividers according to requirements—*e.g.*, alphabetically, numerically, territorially, etc. A movable follower block in the tray enables cards to be kept packed tight when not in use and is placed so that cards can be loosened to create a "V" opening for easy access and rapid selection by the machine operator.

Speed in operation and convenience in use are essential features in equipment supporting the accounting machines, and these requirements have led to developments and refinements in housing equipment.

With the normal type of card tray, accounts required for posting or reference purposes take time to locate: various manufacturers are marketing equipment to deal specifically with this point.



Ledger Trays Housed Crossways in a Fire-Safe Cabinet.

Fire-Safe Equipment

It should not be overlooked that the information on the ledger cards, particularly if it is a sales ledger, is of vital importance. For this reason it is prudent to house ledger trays and binders in safe files which are specifically designed to resist fire and to accommodate two or three ledger trays in each drawer. These safe files give protection from fire at the point of use.

CHAPTER 19

Punched Card Systems

Everyone who has watched a steam organ at a fair or pumped a front-parlour pianola will have some idea of the complex mechanical repertoire that can be controlled by series of holes punched into paper or thin card. A steam organ is literally controlled by cards, each about a foot long, which are linked to form an endless belt: the organ *reads* each card by blowing steam through the holes. No one who has heard a fairground organ playing Sousa, and watched the musician puppets magically jerk alive as each instrument joins the ensemble, should be at all surprised to learn that the totals and balances of routine accountancy can be controlled by similar methods.

The punched card system of accounting differs from other systems in so far as all the work involves the use of special cards in which relevant information has been recorded by means of a series of punched holes.

When punched, the cards can be read and processed by several different types of machines, including accounting machines, tabulators, calculators and, more recently, electronic computers. These machines, having read the information on the card, can process the information on the cards in a variety of ways.

Accounting machines and tabulators perform simple calculations and print out the results. Calculators and computers often perform more complex operations, but in each case the basic information can be first read from the original punched card.

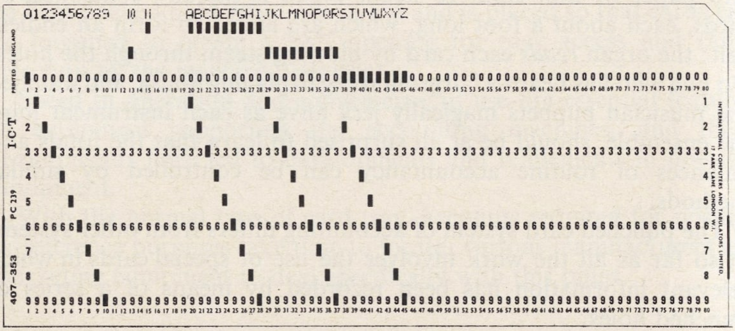
Punched cards, therefore, are business documents that can be read speedily and accurately by machine. The most widely used punched cards contain either 40 or 80 columns of information, the precise meaning of the information in each column being determined by the positions of the punched holes.

The world's first punched card machine was developed in America by Dr. Herman Hollerith in 1884 and was first used in 1890 to assist in the compilation of census statistics.

Punched cards are still widely used today for the production of census and opinion poll statistics, but the extreme versatility of punched card systems renders them equally suitable for monetary procedures, payroll work, stock and production control, invoice preparation and many other accounting routines.

1. Punched Cards

A commercial punched card is a small, flexible rectangle of high-quality card which may be punched with holes to record accounting information in such a way that it may be transferred automatically to accounting machines. The normal punched card may hold up to eighty columns of information, although there are cards with twenty or forty columns. One hole punched in a column represents a number in the series 0 to 11 according to its position in the column. Combinations of two or three holes punched in a single column represent letters of the alphabet and other symbols.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Example of an 80 Column Punched Card Showing the Punching Codes for the 26 Letters of the Alphabet and the Numerals 0–11. These are interpreted along the top of the card.

The information punched into cards can be classified under three main headings:—

Reference information: This usually consists of code numbers stating to which person, department or stock item the card refers. For example, a sales organization may employ one thousand salesmen working in ninety local offices which are divided among five geographical regions. In such a case the number 847493, punched into a card, could refer to salesman 847, of local office 49, of region 3.

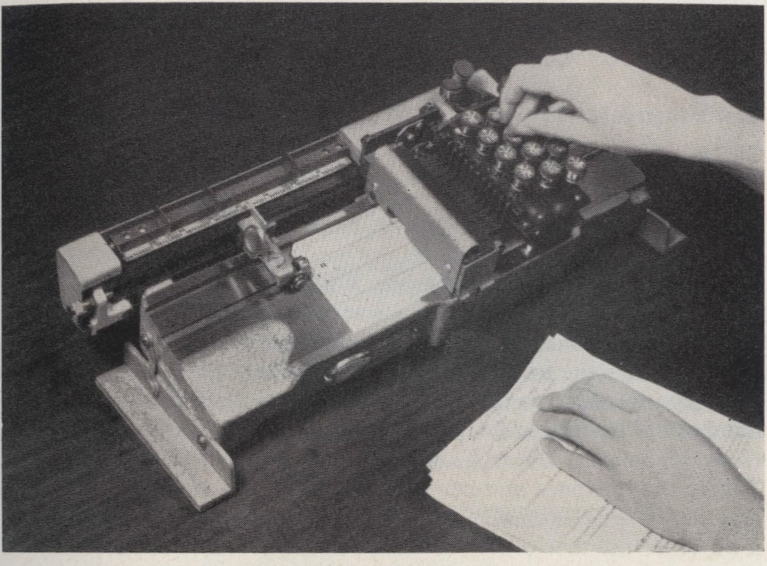
Processing information: This will be sterling or decimal numbers for calculations, or alphabetical punchings—names and addresses, for example—which may be printed on invoices or statements of account.

Logical information: In this case holes are meant not to represent numbers or symbols, but to give instructions to a machine. For example, a hole punched in the "1" position one column to the left of a sterling number can be used by the machine as an instruction that the sterling figure is to be treated as a debit.

2. Punching and Verifying

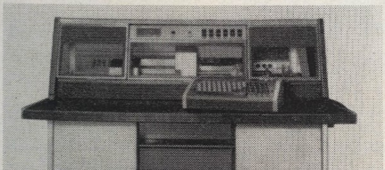
The card preparation department of a data processing installation normally contains two types of machines.

Punches: This machine either moves a card along under a set of knives, allowing the operator to punch holes in each column in turn, or sets up knives over each column, punching the whole card when the operator signals that the information is complete. The operator works either at a typewriter keyboard or at a smaller, numerical keyboard (in this case alphabetical information can be punched by depressing two keys at the same time).

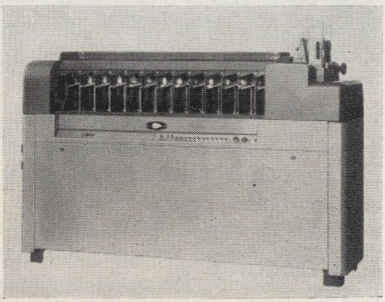


A Simple 80 Column Hand Punch with Numerical Keyboard.
(There are more complex electrical versions.)

Verifiers: When cards have been punched, they and the original documents are passed to a verifier operator, who sits at a keyboard machine similar to the punch. Each key depression by the verifier operator tests for a hole in the corresponding position on the card.



Verifier: for Checking information.



Sorter: for placing Cards in numerical or alphabetical sequences.

The operator feeds the punched cards through her machine, testing each punching to see that it agrees with the information in the original documents. Where a mistake has occurred the machine rejects the card. If all the holes in a card are correct a small "v" notch is cut in the top edge of the card.

A three-machine punching system is also available. In this system a square hole is punched by the first operator which the verifying operator elongates; all the cards are then passed through an automatic verifier which rejects any card containing holes which have not been elongated.

3. Sequencing

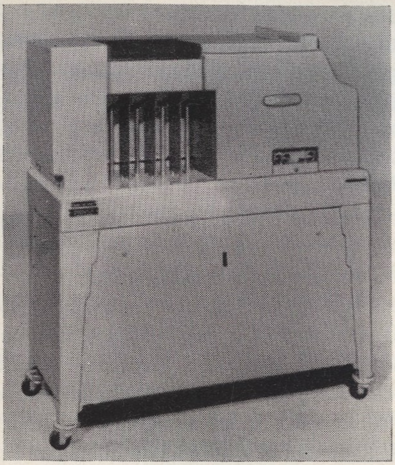
The punched and verified batches of cards are accumulated until the end of the accounting cycle—the end of the week for pay-roll processing, for example—when the file is complete.

Sorters: The success of most data processing procedures depends on the cards being in some sequence. When a file is complete the first action is to sort it into order on a sorting machine. The sorter is able to read one column at a time, directing the card to one of twelve pockets according to the number it detects in the column. Card files must pass through the machine once for every digit in the sequencing number before they are in order. If subsequent processes require the cards in another order, further sorting passes will be necessary. Taking the reference number example, the cards containing the sales record for each salesman can be held in salesman number order, local office number order, or region number order; or they may be held in salesman order within local office order, or in any combination of these sequences.

Collators: Once a file is ordered it can be related to any other file in the same order. This ability is used to relate files of variable information to files of static information. The names and addresses of customers would be classified as static file information, changing very infrequently; the weekly details of their orders would be variable file information. Two such files could be "merged" each week on a collating machine—that is, one file would be created in which a set of name and address cards precedes each company's weekly detail cards—as a preliminary to printing the weekly invoices. The collator can perform any selecting and merging operations of this kind on any two files in which the reference information does not exceed sixteen digits.

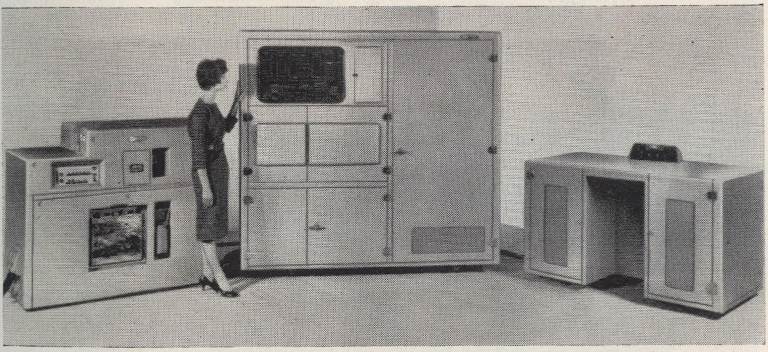
4. Calculating

Before cards are passed to the printing routines which will create the end product of the data processing sequence, it may be necessary



Collator: to match two related files in the same sequence. Many other complex sequencing operations are possible.

to multiply or divide the numbers punched in one field by a constant figure or by the contents of another field in the same card. These functions (and more complex ones such as square root calculations), and combinations of operations—to calculate PAYE taxation contributions, for example—are performed by a calculator.



Calculator: complex calculations for commercial and scientific use, based on information recorded in punched cards, can be performed. The machine is programmed by plug-boards, and has a memory drum. Results are punched into cards.

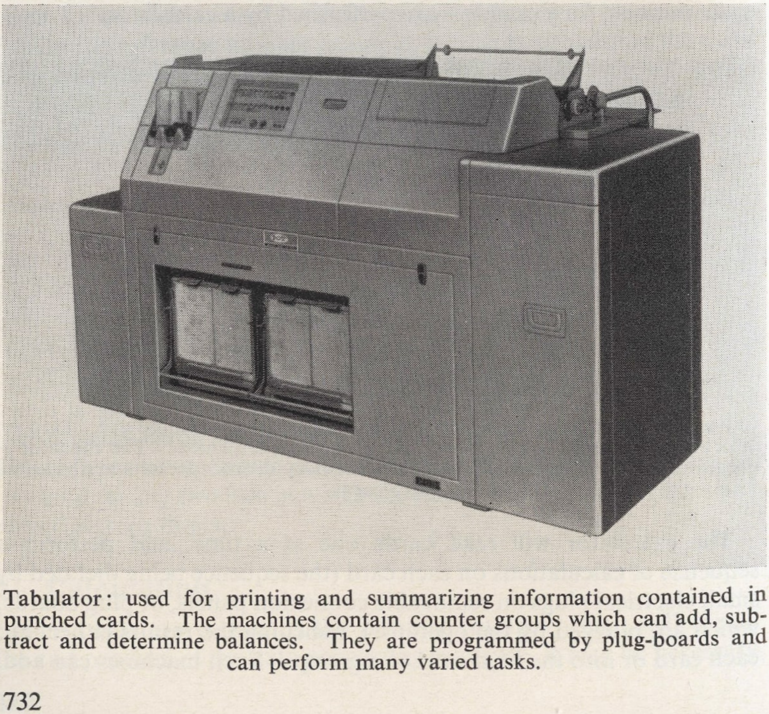
The calculator will read cards one at a time, and perform a sequence of calculations on each card (the sequence being dictated by small electrical plugs on removable connexion panels, or plug boards, which are plugged by the operator), punching the results either into each card or into the final card of a group. Such machines can add, subtract, multiply or divide numbers up to ten digits (sometimes, with special routines, "double-length working" will extend this to twenty digits) and make logical distinctions—such as choosing not to perform a tax calculation when a man's wages are less than his tax-free pay.

5. Tabulating

When all punching, verifying, calculating, merging and sorting operations are completed on a file it can be passed to a tabulator for the final result to be calculated and printed.

A modern tabulator has at least two sensing stations, both capable of reading all 80 columns of a card. The reference numbers in each card can be compared with the reference numbers in the card following. The machine can therefore detect the end of groups of related cards: this is known as a change of control. During each card passage, information in the card can be added or subtracted into counters, printed, or used to select machine movements. When a change in reference number is detected, the machine can be asked to balance the totals in its counters, print out interim results, zeroize counters and punch carried-forward totals into a new card.

Machines of this kind have anything up to 100 counter wheels which may be connected together for each job in groups of varying



Tabulator: used for printing and summarizing information contained in punched cards. The machines contain counter groups which can add, subtract and determine balances. They are programmed by plug-boards and can perform many varied tasks.

sizes; they are able to print documents up to 120 characters wide; they can distinguish three different types of control change; they can detect and take action on sheet-end conditions when printing invoices and ledger sheets; they also have powerful logical abilities which will control a sequence of operations from designation holes in the cards. Information in any column of the card can be added to any counter wheel and printed in any character position. All of these activities depend on the plugs which have been inserted in removable panels or plug boards. Effectively the machine is no more than a set of disunited parts until it has a plugboard. Each plugboard creates a special purpose machine for the job on hand. It is usual for complex boards to be stored ready-plugged.

The printed sheets which are produced by the tabulator can be regarded as the final product of only *one* sequence of operations in a many-branched system, for the cards which produced the printing can be re-sorted and presented to the tabulator with a differently plugged board to produce a different printing. It is in this way that the same cards which print payslips may be used to achieve labour costings, and then merged with stock-control cards to produce job costings. Good punched card systems design makes the maximum use of each piece of information punched into the cards.

6. Ancillary Equipment

In addition to the main range of punched card machines described in the preceding paragraphs two further machines should be described; these are the interpreter and the reproducing-summary punch.

Interpreters: These read the holes punched in a card and translate them into characters printed on the face of the same card. The normal practice is to print each character above the column it interprets, although machines are available which will print the characters in one of several positions on the card, or transfer the printing to another card.

Reproducing-summary punches: These are able to read the whole, or part, of a card and punch the information into a second card. This facility is used for reproducing old cards, which may have become so worn that normal machine reading is liable to errors. These machines may also take information from a tabulator to punch a summary card when carry-forward files are being created.

7. Summary of Equipment

Cards: May contain 80, 40 or 21 digits of information. Single punching for numerical information, double punching for alphabetical information.

Punch: Typewriter or simpler keyboards. Either punches column by column, advancing the card automatically, or stores information and punches whole card at one blow.

Verifier: Typewriter or simpler keyboards. Tests punched holes column by column to agree with key depressions. Rejects incorrect cards. Marks cards which are correct.

Sorter: Reads cards one column at a time, directing each card into one of twelve pockets (0–11) according to hole in column. Cards may be directed to 13th (reject) pocket. Speed—200–1,000 cards per minute.

Collator: Reads two files of cards at same time. May compare two sixteen digit numbers for equality or variants of inequality and direct cards accordingly. Used for merging two files; selecting-out unmatched groups; sorting out cards which are out of sequence; inserting blank cards in a sequence, etc. Speed—240 cards per minute each hopper.

Calculator: Performs addition, subtraction, multiplication, division, and longer sequences, according to plugboards, to calculate tax contributions etc. Speed—100 cards per minute.

Tabulator: Up to 100 counter wheels, 120 printing positions. Can detect three changes of control. Performs addition, subtraction and balancing. Selective printing and totalling depending on plugboards and control holes in cards. Speed—100–200 cards per minute.

Interpreter: Reads punching in cards and prints translation in characters above columns punched on other areas of card or on alternative card. Speed—60–100 cards per minute.

Reproducing-Summary Punch: Used to reproduce cards either in whole or in part. May take information from tabulators to create carry-forward cards. Speed—100 cards per minute.

8. British Standards

The use of punched card systems has developed quickly over a number of years, not only for office accounting machine equipment and for statistical work, but also for machine tool control systems. In the absence of any standard coding methods, the various systems have taken diverse paths, thus making difficult the work of those responsible for considering standard forms of coding. Furthermore, equipment valued at many millions of pounds has been manufactured and put into use to deal with the various cards and coding—such equipment has an effective life of many years.

At a conference called some years ago to consider this problem, it was found that a widespread demand existed for standards relating, not only to dimensional interchangeability, but to many other features, prominent among these being the question of coding.

Consequently, a specification was published setting out codes intended for guidance in future designs, particularly where interchangeability was desired, and relates to alpha-numeric punching codes for data processing cards, nominal size $7\frac{3}{8}$ in. × $3\frac{1}{4}$ in. Drafts applying to other aspects of punched cards, such as their dimensions and their properties are being prepared.

The preparation of other standards in respect of data processing equipment generally, will be referred to in the next chapter under the appropriate heading.

9. Manual Systems

These systems operate on the principle of gravitation. Cards are punched with a series of holes. On each card a selected hole is "slotted." A needle is inserted into a pack of cards through one of the holes and those that have been slotted drop away when the needle is raised. There are two main systems, each operating in a different way but using the same principle, and they will, therefore, be described separately.

Marginally Punched Cards

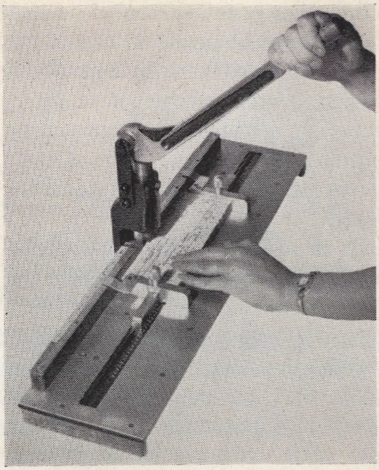
Original Entry: With this system, cards are punched with round holes along one or more of their edges, either in a single row or two or more deep. Each hole represents a number, letter or classification, which is printed against it. There is no fixed size of card, since this depends on the number of holes required for selection of the information and the space needed for recording it.

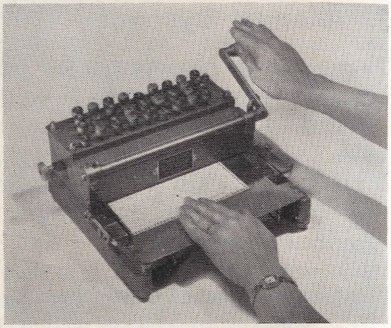
Usually, separate cards are employed, but they can be made up into sets to provide a carbon copy of the original entry. Quality of material will depend on the nature of the application, but in all cases the holes must be punched accurately and to exact registration. Entries may be made by hand, typewriter or an accounting machine. The cards may be used in an addressing machine, or mounted with metal or plastic address plates, or spirit masters; they may be photocopied or apertured and mounted with microfilm ready for instant needle selection.

Slotting: When the required information has been entered on the cards, the holes relevant to the recorded detail are slotted away to the edge. This may be done by a:

Hand Slotter or Platform Punch: These are suitable for the user operating with individual cards.

Key Punch: These are used where large numbers of cards are in use, with variable information.

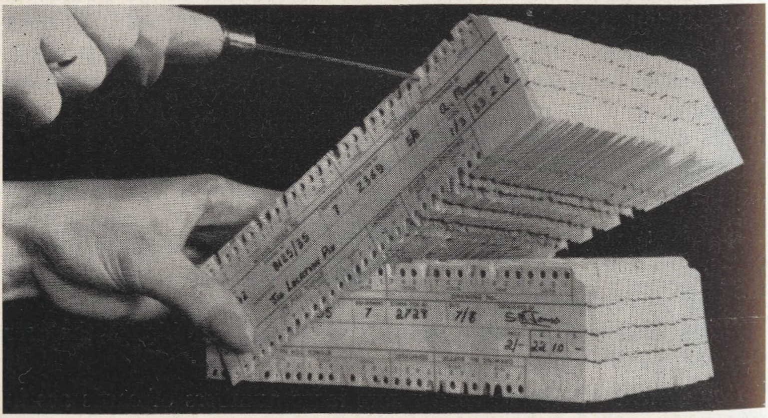




Above: Gang Punch.
Top Right: Hand Slotter or Platform Punch.
Bottom Right: Key Punch.

Gang Punch: This type is more suitable where cards are prepared in bulk and bear similar information.

Sorting: After slotting, the cards are then ready for sorting. They are neatly stacked so that a needle can be inserted through a selected hole, penetrating the entire pack. When the needle is raised clear of the "deck," cards that have been slotted in the chosen position will



Needle Sorting.

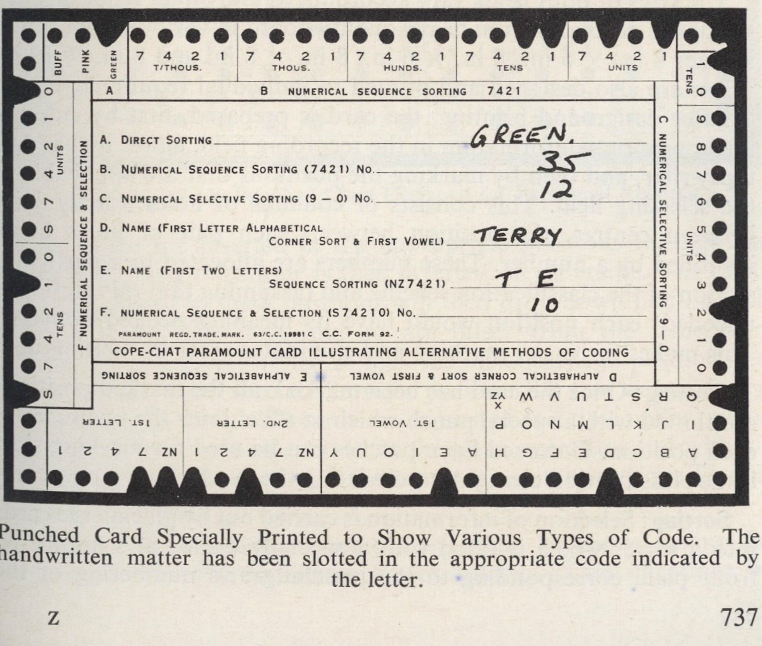
then drop clear of the pack. Alternatively, a multi-needle selector is available on which can be set a programme to select information from a large quantity of cards. In certain circumstances cards can be selected and referred to without breaking the sequence of cards, but this is possible only when the information is on a single edge of the card.

With the use of simple hole coding and needling techniques, it is possible not only to select cards of specific categories, but also to sort the cards into alphabetical or numerical sequence. The cards that have been selected can then be totalled on an adding machine, or scrutinized, or can have information extracted from them before being returned to the file.

Coding: The capacity of the card, while dependent upon the size of card and number of holes, is considerably increased by the use of codes. Two of the principal and simple forms of codes are as follows:—

Direct Selection: One hole is used to represent one item of information.

Numerical Selection: In one version of this, ten holes are numbered 0-9 to form a "field." Each field is allocated to—for instance—hundreds, tens and units. One slot is then made in each field to give the required number. For example, 745 would be slotted 7 in the hundreds field, 4 in the tens field and 5 in the unit field.


A. DIRECT SORTING GREEN.
B. NUMERICAL SEQUENCE SORTING (7421) No. 35
C. NUMERICAL SELECTIVE SORTING (9 — 0) No. 12
D. NAME (FIRST LETTER ALPHABETICAL CORNER SORT & FIRST VOWEL) TERRY
E. NAME (FIRST TWO LETTERS) SEQUENCE SORTING (NZ7421) T E
F. NUMERICAL SEQUENCE & SELECTION (S74210) No. 10
PARAMOUNT REGD. TRADE. MARK. 63/C.C. 19981 C C.C. FORM 92.
COPE-CHAT PARAMOUNT CARD ILLUSTRATING ALTERNATIVE METHODS OF CODING
BUFF
PINK
GREEN
7 4 2 1 T/THOUS.
7 4 2 1 THOUS.
7 4 2 1 HUNDS.
7 4 2 1 TENS
7 4 2 1 UNITS
A
B NUMERICAL SEQUENCE SORTING 7421
C NUMERICAL SELECTIVE SORTING 9 — 0
1 0 TENS
9 8 7 6 5 4 3 2 1 0 UNITS
F NUMERICAL SEQUENCE & SELECTION
0 1 2 4 7 S UNITS
0 1 2 4 7 S TENS
E ALPHABETICAL SEQUENCE SORTING
D ALPHABETICAL CORNER SORT & FIRST VOWEL
1ST LETTER
2ND LETTER
1ST VOWEL
1 2 4 7 NZ 1 2 4 7 NZ
Y U O I E A
H G F E D C B A
P O N M L K J I
XYZ W V U T S R Q

Punched Card Specially Printed to Show Various Types of Code. The handwritten matter has been slotted in the appropriate code indicated by the letter.

Other codes and variations are available and these include *alphabetical, sequence sorting and pyramid codes*. Some codes are in condensed form, as generally the more condensed the code, the more information can be put on to a card. This will entail more slots but not necessarily more sorting. The codes employed depend on the requirements of the specific information.

Applications: This system can be successfully employed in many circumstances for use with files incorporating as few as 500 cards or several hundred thousand. In certain circumstances, where the application is suitable, several million cards per annum can be handled successfully. The use of pre-slotted cards assists in handling this number.

It is impossible to detail all the possible applications, but the system can be used for job costing and stores control, advertising and direct mail records, sales and purchase ledger records, progress and production control, personnel records and statistical records.

Body Punched Cards

Original Entry: In this system the card is divided into two sections.

(1) The "*Recording Field*," which is at the top of the card and is used for written or typed information.

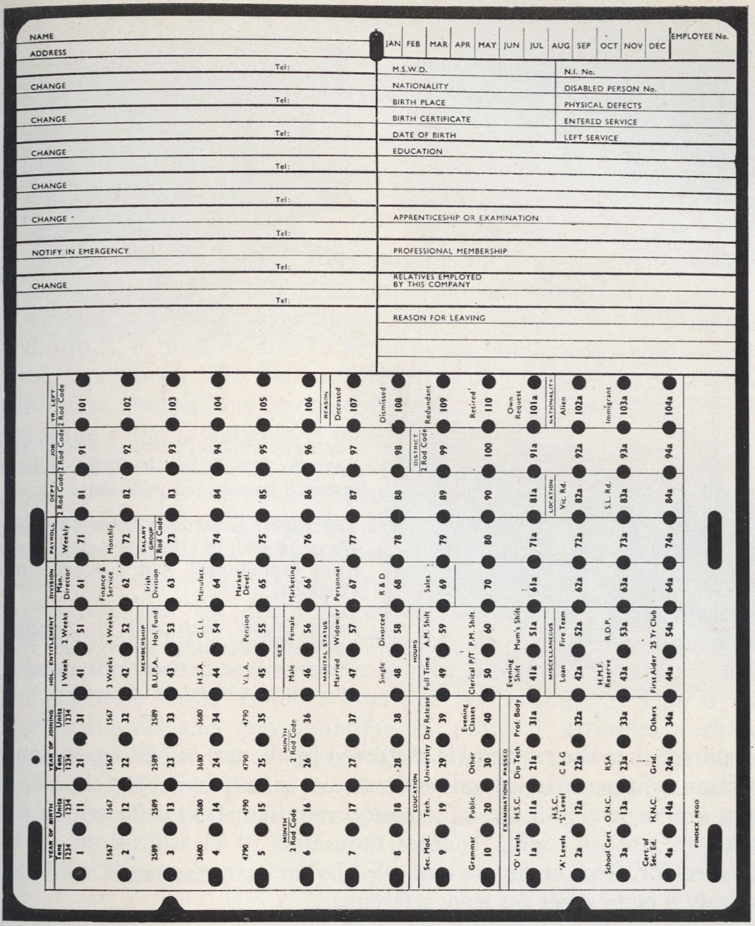
(2) The "*Selecting Field*," which forms the body of the card and in which perforations are made to obtain statistical information.

The sizes of both fields vary according to individual requirements. Cards are produced from heavy quality board in various colours and in sizes 8 in. × 5 in., 8 in. × 6 in., 8 in. × 8 in. and 8 in. × 10 in. These are also designed and printed to individual requirements.

After design and printing, the card is prepared, first by entering the appropriate information in the recording field, either by hand or typewriter, and then by marking the positions that are applicable in the selecting field. This consists of columns of holes exactly $\frac{1}{2}$ in. between centres, the position between each pair of holes being identified by a number. These numbers are allocated to a particular section of the classification scheme and (assuming that this section is uncoded) each position would have its meaning printed above it. This makes for easier marking and eliminates error in "setting up."

Slotting: Once the card has been marked, all the marked positions are slotted with a special punch which in effect joins the two holes of each position. Gummed linen patches can be used for masking slots if the classification changes, so obviating the need to use a new card.

Sorting: Selection of information is carried out by placing the cards into a sorter which is fitted with a specially drilled and numbered front plate corresponding to the punching and numbering of the



NAME

ADDRESS

Tel:

CHANGE

Tel:

CHANGE

Tel:

CHANGE

Tel:

CHANGE

Tel:

CHANGE

Tel:

NOTIFY IN EMERGENCY

Tel:

CHANGE

Tel:

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

EMPLOYEE No.

M.S.W.D.

N.I. No.

NATIONALITY

DISABLED PERSON No.

BIRTH PLACE

PHYSICAL DEFECTS

BIRTH CERTIFICATE

ENTERED SERVICE

DATE OF BIRTH

LEFT SERVICE

EDUCATION

APPRENTICESHIP OR EXAMINATION

PROFESSIONAL MEMBERSHIP

RELATIVES EMPLOYED BY THIS COMPANY

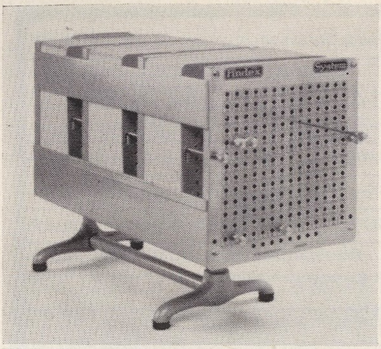
REASON FOR LEAVING

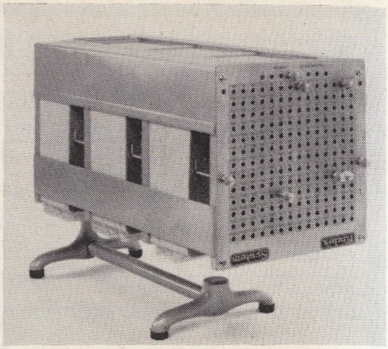
YEAR OF BIRTH Tens 1234 Units 1234
YEAR OF JOINING Tens 1234 Units 1234
HOL. ENTITLEMENT
DIVISION
PAYROLL
DEPT. 2 Rod Code
JOB 2 Rod Code
YR. LEFT 2 Rod Code
1 11 21 31 1 Week 41 2 Weeks 51 Man. Director 61 Weekly 71 81 91 101
1567 2 1567 12 1567 22 1567 32 3 Weeks 42 4 Weeks 52 Finance & Service 62 Monthly 72 82 92 102
2589 3 2589 13 2589 23 2589 33 MEMBERSHIP B.U.P.A. 43 Hol. Fund 53 Irish Division 63 SALARY GROUP 2 Rod Code 73 83 93 103
3680 4 3680 14 3680 24 3680 34 H.S.A. 44 G.L.I. 54 Manufact. 64 74 84 94 104
4790 5 4790 15 4790 25 4790 35 V.L.A. 45 Pension 55 Market Devel. 65 75 85 95 105
MONTH 2 Rod Code 6 16 MONTH 2 Rod Code 26 36 SEX Male 46 Female 56 Marketing 66 76 86 96 106
7 17 27 37 MARITAL STATUS Married 47 Widower 57 Personnel 67 77 87 97 REASON Deceased 107
8 18 28 38 Single 48 Divorced 58 R & D 68 78 88 98 Dismissed 108
EDUCATION Sec. Mod. 9 Tech. 19 University 29 Day Release 39 HOURS Full Time 49 A.M. Shift 59 Sales 69 79 89 DISTRICT 2 Rod Code 99 Redundant 109
Grammar 10 Public 20 Other 30 Evening Classes 40 Clerical P/T 50 P.M. Shift 60 70 80 90 100 Retired 110
EXAMINATIONS PASSED 'O' Levels 1a H.S.C. 11a Dip Tech 21a Prof. Body 31a Evening Shift 41a Mum's Shift 51a 61a 71a LOCATION 81a 91a Own Request 101a
'A' Levels 2a H.S.C. 'S' Level 12a C & G 22a 32a MISCELLANEOUS Loan 42a Fire Team 52a 62a 72a Vic. Rd. 82a 92a NATIONALITY Alien 102a
School Cert 3a O.N.C. 13a RSA 23a 33a H.M.F. Reserve 43a R.D.P. 53a 63a 73a S.L. Rd. 83a 93a Immigrant 103a
Cert. of Sec. Ed. 4a H.N.C. 14a Grad. 24a Others 34a First Aider 44a 25 Yr Club 54a 64a 74a 84a 94a 104a
FINDEX REGD.

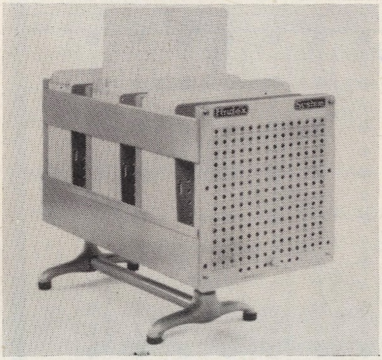
A Typical Body Punched Card Designed for Personnel Records.

cards. Rods are inserted in the appropriate positions through the front plate, and the sorter is then inverted on its cradle. The cards that are slotted in these positions will then drop down half an inch (the length of the slot), and so are offset from the remainder. Another rod is then inserted to lock the offset cards in position and the sorter is returned to the upright position for easy access to the required cards. Up to 750 cards can be sorted at a time under one or a combination of classifications, in the same operation and without disturbing the filing sequence. When not in use the cards are filed in storage cabinets.

Coding: The maximum number of single positions, using the largest card, is 182. Should a greater number of classifications be







Top Left: Cards Placed in Sorter and Prior to Selection. Rods have been inserted to selected positions.

Top Right: Sorter has been Swivelled Through 180° to Offset Selected Cards from Remainder and Locked into Position.

Left: Sorter Returned to Original Position, Selecting and guide rods withdrawn, and offset cards standing on locking rod ready for use.

required, then the capacity is increased by the use of coding on some sections of the card. Several methods can be employed, but the use of any one depends on the information required. It is sufficient to say that the use of coding enables thousands of classifications to be catered for. Such codes are compiled by the manufacturers, who also supply a code sheet for easy reference.

Applications: The system can be employed where any record requires a certain amount of typed or written information on a card and the need to sort groups of cards with common factors with the minimum of delay. Such applications would include personal, employment, educational, medical, production and statistical records.

CHAPTER 20

Electronic Computers

Given proper instructions, an electronic computer can perform many operations at extremely high speed. Computers vary greatly in their capacity and can cost anything from a few thousand to several million pounds.

Before a computer can obey any instruction, it must obviously possess the ability to undertake some basic functions.

It must be able to accept and to store instructions and information fed into it; it must be able to perform the required calculations and other operations with the information and, finally, it must have the ability to present the processed results of its work in a format acceptable and intelligible to man.

A computer then is a device capable of automatically accepting data, applying a sequence of processes to the data, and supplying the results of these processes. There are many different types of computer which, for the purpose of this volume need not be the concern of the reader. However, it may briefly be stated that the computer used for the majority of commercial and industrial applications is the Digital Computer. As the name implies, it represents data by means of digits. The Analogue Computer, used for scientific work, employs analogue representation. This is the representation and corresponding of physical variables such as distance, rotation, or voltage, with numerical variables that occur in a computation. Thus, an analogue computer measures and a digital computer counts. This Chapter is concerned with the latter.

1. The Program

A computer program is the series of instructions which tells the computer how the information it is to receive is to be processed and how the processed information is finally to be presented.

The program is the first item of information that must be made available to the computer, and how this is achieved will be explained in the next section. Now that the word "program" has been defined, it is appropriate to explain how a program is prepared.

Programmers today have a much easier task than their predecessors of five or ten years ago. In the early days of computers, programmes had to be written in the special code in which the computer operated. Every instruction had to be translated into the numerical symbol representing the required instruction.

A program for a complex computer function might have required thousands of individual instructions and consumed many hundreds of hours to prepare. Today the programmer is able to avail himself of new programming techniques which allow programs to be written in a format more closely related to the functions to be performed. For example, a mathematical problem can be presented to the computer, using a notation similar to ordinary mathematical symbols and formulae. Programs for commercial applications can be written in a language closely approximating to plain English.

Although modern computers still work in their own code, the task of translating instructions into this code is now performed automatically by the computer. This is achieved by using special programs, supplied by the computer manufacturers, which now generally form a standard part of the equipment and customer service. These programs are known as the "Software."

2. Hardware

By contrast with software, hardware is the physical devices which make up the computer and its satellite equipment. These can be considered under the following headings.

Central Processor and Main Store

These form the computer proper. They work at extremely high speeds and have no direct communication with the outside world.

Peripherals

These convert physical representations of information into the electronic representation used by the central processor and vice versa. Examples are the card reader and paper tape reader (input), and card punch and line printer (output). Other peripheral devices, for example magnetic tapes and cathode ray tube/light pen, can handle both input and output. All peripherals are physically connected to the computer; that is to say they are "on-line."

Ancillaries

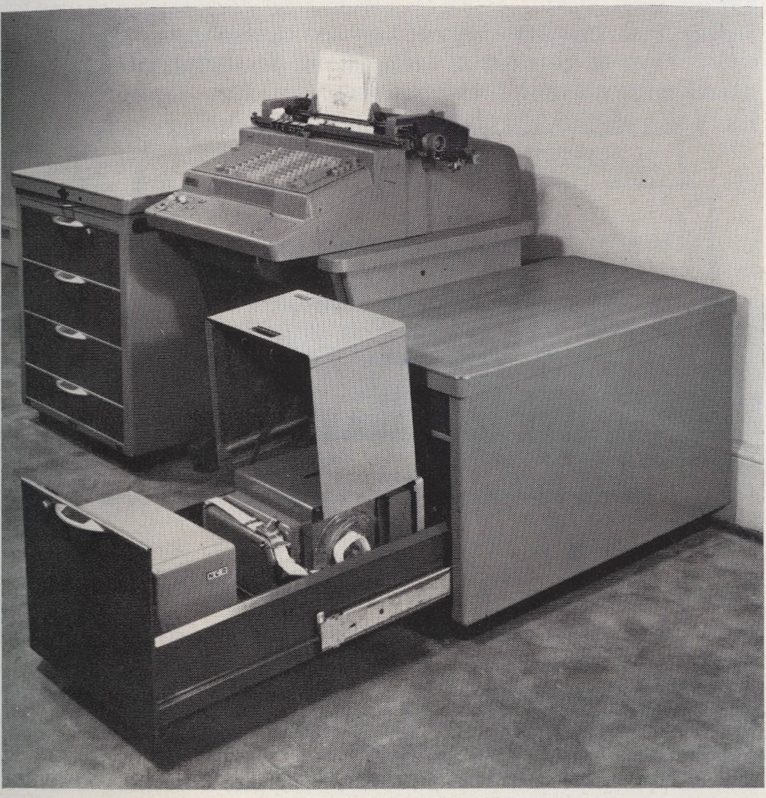
These devices are not connected to the computer; *i.e.*, "off-line." Some provide a means of converting between computer readable media (paper tape and punch cards), and source documents or printed results, while others manipulate computer readable media. Examples of the latter would be card sorters and collators.

3. Input

In data processing terminology, the word "input" merely means the putting in or feeding of information into the computer.

Once the program, which was described in the previous section, has been fed into the computer, the machine has to store it, and this aspect will be dealt with in more detail in subsequent paragraphs.

When the program has been stored, the information on which the machine is to work can be input. Information, or data, may be input in a variety of ways, but punched paper tape and punched cards are the media most widely used today.



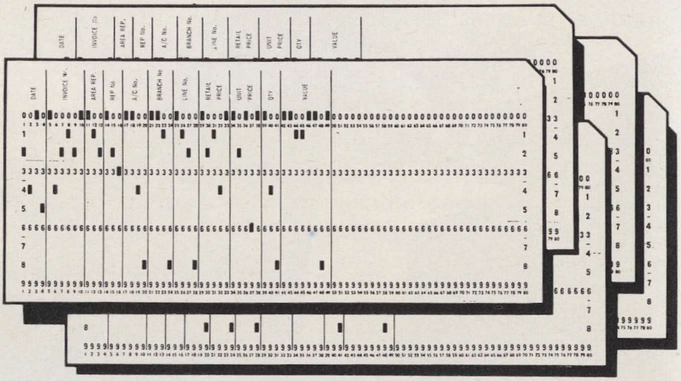
Example of an Input Preparation Unit which enables information for computer processing to be listed, punched into tape and verified in one high speed operation. Picture shows the parent machine "wired" to an automatic paper tape punch (with lid open).

Both punched paper tape and punched cards may be produced in a variety of ways, either manually or automatically. Where tape or cards are produced automatically, the punches may well be linked to other machines, such as accounting or adding machines, which cause selected information to be punched as a by-product of conventional accounting routines. This technique is known as "data capturing" and often incorporates sophisticated electronic checks to ensure that only accurate information reaches the computer.

Punched Cards

The information to be input to the computer is first punched into cards which are then "read" by a punched card reader. As the information is read it is transferred into the computer, which then processes the information in accordance with the instructions it has already been given.

The most common forms of punched cards in use today contain either 40 or 80 columns of information, depending on the type of machine for which they are designed.

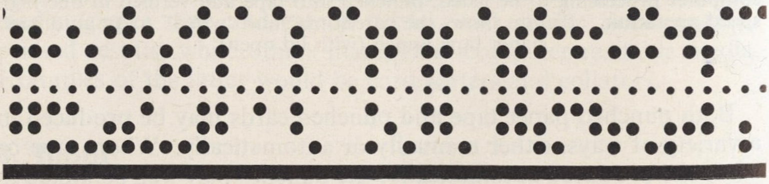

DATE
INVOICE No.
AREA REP.
REP No.
A/C No.
BRANCH No.
LINE No.
RETAIL PRICE
UNIT PRICE
QTY
VALUE

Punched Cards.

Punched Paper Tape

In principle, the technique of recording information in punched paper tape is quite similar to that used with punched cards.

Coded information is punched character by character into the tape until all the desired information has been recorded. The tape is then fed into a paper tape reader which "recognizes" the characters on the tape and transfers them to the computer's working area.



Punched Paper Tape.

Magnetic Tape

A magnetic tape can accept and retain information in the form of magnetically polarized spots. Although its use in sound recording is long established, the employment of it in data processing has only developed over the last few years.

In the past, only the computer could "write" on magnetic tape, using very expensive computer time to do so; the actual operation being incorporated in the instructions within the computer program.

Devices have recently been developed which, from a keyboard, will imprint characters on to a magnetic tape, which can then be read direct into the computer.

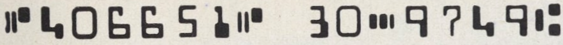
Magnetic tape units incorporating reading and writing heads, permit tape preparation by manual methods of suitable input to the computer, thus allowing for a more flexible installation.

Character Recognition

Under this heading can be classified the methods employed for the automatic reading of documents, directly into the computer, from forms that obviate the necessity to transcribe the original source document to punched cards or tape. They tend, however, to be reserved for rather specialized applications.

Magnetic Ink Character Recognition (M.I.C.R.): This method was introduced in 1962 by some of the larger English and Scottish banks for the handling and recording of information from cheques.

It is the machine reading of characters printed in magnetic ink. The characters are specially designed to ensure an accurate pattern of magnetization, but they are also readable to human beings. In general all the English speaking countries have adopted a style of character called E13B fount, and the main European and Scandinavian countries have chosen a style referred to as C.M.C.7.



E.13.B. Fount for Magnetic Ink Characters.

Positioning of printed information to be read must be in accordance with the requirements of M.I.C.R. equipment.

Optical Character Recognition (O.C.R.): A more recent development in character recognition is the application of the "electric-eye" technique, by which O.C.R. equipment can read characters printed in ordinary ink. The method is based on the principle of light reflection and, where this reflection is broken, *i.e.*, when a character passes in front of the reading eye, the signal thus obtained is converted into a code recognizable by the computer.

The I.S.O. has agreed upon a style of character called O.C.R. "B" fount. Although there are certain machines in use, especially in America, that rely on their own special style of character, it will only be a question of time before there is complete standardization.

ABCDEFGH abcdefgh
IJKLMNOP ijklmnop
QRSTUVWX qrstuvwx
YZ*+,-./ yz m åøæ
01234567 £$:;<%>?
89 [@!#&,]
(=) ¨ ´ ` ^ ~ ¸ ˘
ÄÖÅÑÜÆØ ↑≤≥×¯÷°¤

O.C.R.(B) Fount for Optical Characters.

As with M.I.C.R. there are special requirements as to print positions of form data.

Mark Reading Devices: Mark reading is the detection by photo-electric means of simple code-marks, *i.e.*, bars, printed or written on cards or other stationery, the positioning and significance of which have been pre-determined.

Mark sensing is the reading of electrically conductive marks by sensing brushes.

These techniques detect only the presence or absence of marks; they do not attempt to differentiate between characters.

Visual Display Methods

One of the most recent developments is the cathode ray tube visual display method of presenting information, referred to as C.R.T. (see under Output). For input purposes the following techniques are employed.

Light Pen: By touching a particular item of information being displayed on the C.R.T. screen with a Light Pen, the attention of the computer is called to that item, which can then be operated on, in any way determined by the computer program. Associated with a C.R.T./Light Pen, is a set of push buttons which can be used to select program options.

Joy Stick: This is an alternative to the Light Pen, which controls a moving spot of light on the C.R.T. screen. When brought into contact with a particular item of displayed information, it has the same effect as the Light Pen touch.

4. Central Processor

The central processor, besides carrying out arithmetic and other operations necessary to convert input data into the required results, also supervises the sequence of these operations. It is able to select different courses of action within the overall program, dependent upon conditions discovered in the input data or arising from its processing.

It is this ability to modify its action in the light of current conditions which makes the computer the powerful tool that it is. However, the programmer must anticipate all contingencies, no matter how remote, and specify suitable courses of action for each.

The central processor operates at extremely high speed and can communicate only with the storage media.

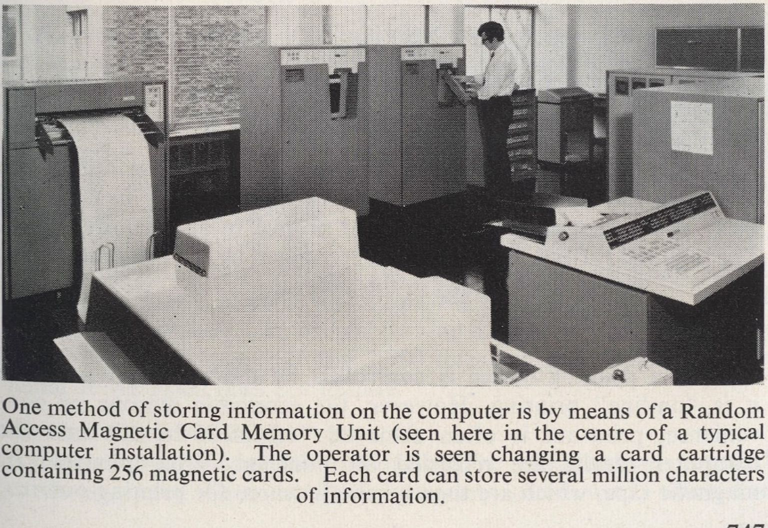
5. Storage

It has already been established that a computer must have the ability not only to receive information but also to store it. A computer stores information in a variety of ways, and a few of the most common methods are briefly discussed below.

Core Store

Nearly all modern computers have built into them an internal store into which is placed the program and other information to which the computer must have ready access.

As a rule, this store consists of a series of special ferrite cores which can be energized or not energized to indicate the presence or absence of a signal. The presence of a signal represents a "1" and the absence of a signal represents a "0", and various combinations of these "l's" and "0's" form the means by which the computer stores its information.



One method of storing information on the computer is by means of a Random Access Magnetic Card Memory Unit (seen here in the centre of a typical computer installation). The operator is seen changing a card cartridge containing 256 magnetic cards. Each card can store several million characters of information.

The size of such a store is, of course, limited by physical considerations. Core store is expensive, and computers with extremely large amounts of such store tend to be proportionally high in price. On the other hand, a computer may often be required to store vast amounts of data far beyond the capacity of any internal core store.

To store such information various other storage media, called backing stores, have been evolved.

Backing Stores

Magnetic tape is the most widely used form of backing store. Information is recorded on the tape in much the same way as on a domestic tape recorder. Storage is achieved by introducing a magnetic spot to represent a "1" and by omitting the spot to represent a "0." Here, as with the core store, different combinations of these "1's" and "0's" are used to represent blocks of information.

Although almost unlimited volumes of data can be stored on magnetic tapes their use can, in certain cases, present one fairly big disadvantage. It is necessary to allow time for the tape unit to locate the section of the tape which contains the required information. This is acceptable when large volumes of information are to be processed sequentially, or if data is only required at fairly infrequent intervals, but proves impractical when data is required frequently, quickly, and in random order.

Other forms of backing store, therefore, have also been evolved to enable the computer to "access" information much more quickly. These include magnetic discs, cards and drums where, although the information is recorded in much the same way as on tapes, access is achieved at much greater speeds.

6. Output

"Input" was defined as the feeding of information into the computer. Similarly, "output" merely means the obtaining of processed information from the computer.

Output may be by a variety of means, including printing. The processed information, which is held in the computer in its coded form, is automatically translated and printed in any required form. The required format, is, of course, determined by the programmer by means of special instructions in the program.

Printers

When the printing device is controlled by the computer program it is "on-line" printing. However, for economic reasons or convenience, print-out is often achieved "off-line." In this case the computer results are recorded on punched cards, punched or magnetic tape, which are then taken elsewhere for printing-out.

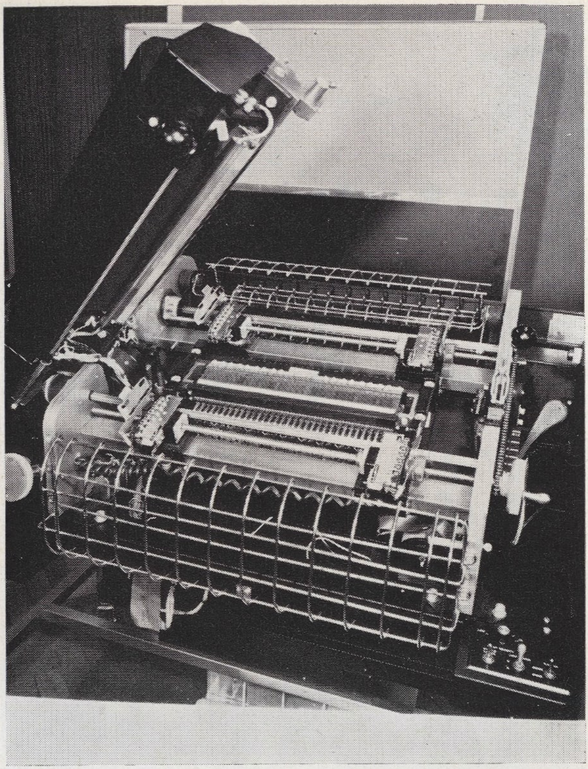
This type of Printer in a computer configuration needs continuous stationery because of high operating speeds.

There are many types of printer each employing different methods of printing the record. That most commonly used is the "line-at-a-time" printer developed from the accounting machine and punched card tabulator. As the name indicates, it prints a whole line of information at a time, during each cycle of its action. The whole line may appear instantaneously or it may be assembled by a process spread over its cycle.

Print-out is achieved by a row of hammers striking the paper against revolving type wheels. The characters are disposed round the circumference of each wheel and the printing positions spaced at intervals—usually $\frac{1}{10}$ in. or $\frac{1}{8}$ in.—along the line of print. Operating speeds range between 300 and 2,700 lines per minute, the average being about 1,000 lines per minute.

Punched Cards and Tape

As with input, output information can be produced on punched cards or tape. These methods are very often used when the



A High-speed Line Printer with the cover removed and the print barrel tilted back, to reveal the print hammer mechanism.

information is required to remain in media suitable for subsequent processing. As already stated, it is necessary to use these methods for off-line working.

Magnetic Tape

This is also used for output purposes. It is particularly useful when there is a considerable volume of results, as its speed is very much in excess of punched cards, tape, or printed output.

The advantages of using magnetic tape can be summarized as follows:—

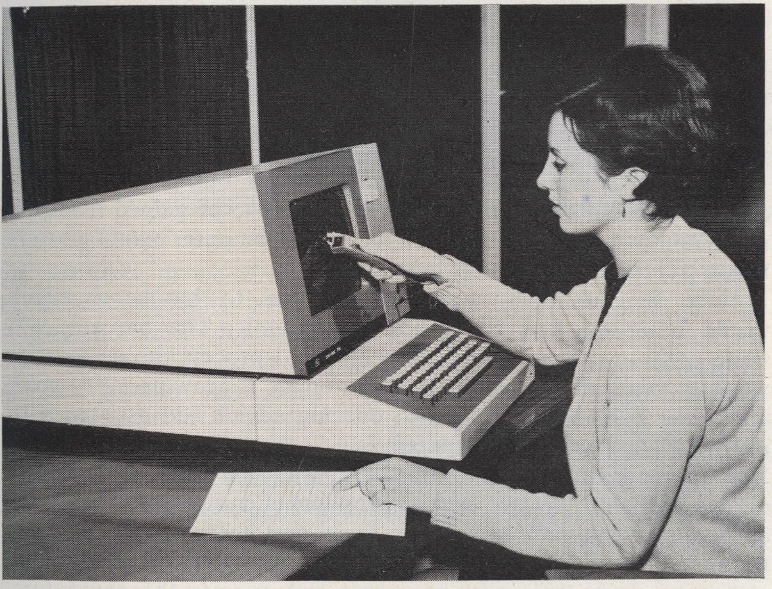
(1) Compactness compared with any other computer readable form of holding information.

(2) Large amounts of information can easily and cheaply be transported between computer installations.

(3) The speed of recording is comparable with that of the computer and therefore, it is more economic to "write" large volumes of results direct to magnetic tape for subsequent off-line printing.

Cathode Ray Tube (C.R.T.)

The recent development of the visual display system using a cathode ray tube enables exact information required at a particular moment of time, to be presented on a screen. For example; the C.R.T. could be controlled by a chief accountant who would call for certain information or statistics obtainable from the computer memory store. This would then be shown on a screen in the accountant's office and action taken accordingly. The use of a Light Pen (see Input) enables amendments to be made.



The C.R.T. Display Unit permits instant call-up of computer held data, and the keyboard and light pen enable the operator to interrogate the computer and to alter information on file.

The storing and presentation of information in this way could reduce the amount of stationery required by the conventional method of recording data on listing paper, it only being necessary to print out that information required on a permanent basis.

7. Computer Applications

Computers are now in daily use in almost every sphere of industry, commerce, science and technology, and to describe even a few applications in detail would require a considerable amount of space.

In commerce, computers are being used in such applications as payroll, invoice preparation, stock and production control and the preparation of a wide variety of analyses.

Industrial and scientific applications include the evaluation of construction techniques, the calculation of stresses and an unlimited number of allied mathematical and technological calculations. More and more engineers and scientists are relying on computers to provide the answer to problems which might formerly have taken years to solve by conventional means.

It can be stated with confidence that the fantastic processing speeds of today's computers are playing a vital part in applying new techniques and ideas to modern industry in an age when man's continued prosperity depends on progress.

8. Computer Bureaux

Even relatively few years ago it was thought that only larger, wealthier companies could possibly afford to use computers. A computer was regarded as an expensive luxury far beyond the reach of the smaller and medium-sized undertaking.

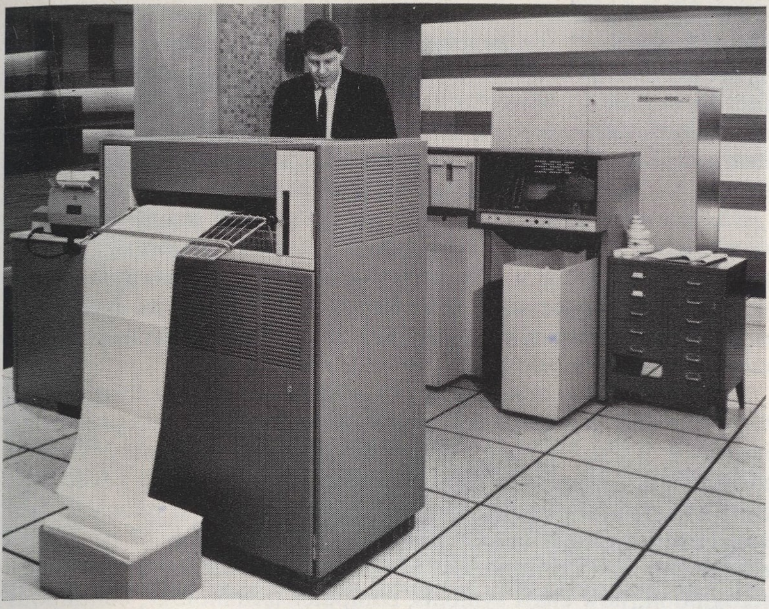
Gradually it was realized that all types of businesses not only could, but should, investigate the advantages to be gained from the use of computers. It was then that the major computer manufacturers began to establish computer bureaux.

These bureaux offer computing facilities to businesses which would otherwise find computing uneconomic. The bureaux will write programs, keep information files and process the customer's work as required. The number of customers is growing every year, and some bureaux are now also offering advice and assistance to potential purchasers of computers.

A recent development of the computer bureaux was recently established jointly by two leading suppliers of computers. They offer a "launderette-type" service to their customers. After a short training course in programming and computer operation, the customers write their own programs and operate the computers, paying only a small fee for the use of the machine. In the near future do-it-yourself computer centres are to be established in various parts of the British Isles, thus offering people all over the country the opportunity to learn about computers. This in itself will provide a valuable service to education in Britain.

9. Ancillary Equipment and Stationery

Although the majority of equipment and supplies are, of necessity, specialist in nature and sold by computer manufacturers themselves, or specialist suppliers, there are some items that can be handled by



One of the "Laundrette-type" Service Bureaux now in operation in Britain.

the stationer or office equipment dealer. These chiefly relate to equipment normally used in offices and therefore applicable to computer room administration; the area of furniture such as cabinets, chairs, etc.; and various stationery requirements. Examples of such supplies have been mentioned in other chapters where appropriate.

The stationer and office equipment supplier should become conversant with the need and availability of these items, which are constantly being developed and extended in range. In localities of computer installations, an understanding of requirements and readiness to meet the needs, could play an important part in the improvement and expansion of a business.

10. British Standards

There are a number of British Standards published, relevant to this chapter. Generally, they are of a technical nature, and only of interest to those concerned with the manufacture and operation of the equipment. As the object of this chapter is merely to introduce the reader to the subject in a simple and non-technical manner, B.S. specifications will not be included, it being only necessary to make reference to them.

Of particular interest, is the "Glossary of Terms used in Automatic Data Processing" (undergoing revision at this moment of time). There are three principle objectives in the publication of this glossary; first to explain to newcomers to the subject the usual meaning of specialized terms, second, to reduce the number of synonyms or near-synonyms for the same concept, which are in use, and, third, to serve in the elucidation of correct equivalent terms in other languages.

The use of punched cards, punched tape and magnetic tape in combination, to provide an integrated data processing system, produced problems which necessitated the consideration of the possible advantages of standardization. Specifications have consequently been published, or are in course of preparation, covering, codes, dimensions and properties of these materials.

Currently, many committees are actively engaged in the preparation of further standards covering most areas of the data processing industry. These include, data transmission, stationery feeding mechanisms for line at a time high-speed printers, input keyboards, card readers and punches, punched tape readers and punches, data acquisition systems, output printers, interconnection of peripheral equipment and computers, programming languages, character recognition, flow chart symbols, computer terminology, continuous stationery, etc.

The authority and co-ordination of this work is in the hands of the Data Processing Industry Standards Committee.

CHAPTER 21

Machine Stationery

Practically all machines use, in one form or another, paper, carbon paper and inked ribbons. In some cases these accessories are for multi-purpose use; in others they are produced for a specific application. Furthermore, it is the quality and properties of these materials that will enable the machine to produce results to a satisfactory standard. Installation of equipment and machines involves considerable expenditure, and it is therefore of paramount importance that the materials used are suitable and of the right grade and quality.

1. Paper

The study of paper is a fascinating subject in itself and it must be remembered that it is the basic raw material of the printing and stationery industry. Every opportunity should therefore be taken to acquire as much knowledge as possible in this field.

Manufacture and classification of paper generally has been dealt with in an earlier chapter. This section is only concerned with the suitability of paper and card for specific machine applications. It should be appreciated that with the continual and increasing growth in the variety of office machines, stationery requirements have not only increased, but are becoming more demanding. The stationer, therefore, must be fully capable and prepared to offer advice to customers on the subject.

Generally, every endeavour should be made to adhere as near as possible to the machine manufacturers recommendations. To ensure trouble free operation, manufacturers spend considerable time and money in research and development in conjunction with the papermaker, before arriving at closely defined specifications for the paper to be used with their equipment.

For the more general office machine applications, such as typewriting (and duplicating), use of the correct type of paper is important, but its specification is not exacting. However, where stationery is designed and manufactured for system application, especially for sophisticated electromechanical and electronic machines, then more precise specifications become all important. It is essential that machine and stationery suppliers are consulted with regard to all specifications before orders are placed and production commences.

There are several British Standards published, covering in particular specifications for the dimensions and properties of punched cards and tape, commercial form layouts, and continuous stationery for general office machines. Where considered relevant, reference has been made. Other standards are in course of preparation.

Autographic Registers

Handwritten register sets are extremely popular and they are replacing the conventional duplicate and counter check book for many purposes. The stationery is in the form of multi-part continuous sets. Originally, these were made up in rolls but today, the design of the registers is such that they accommodate flat packs of stationery.

The method of producing the copies is either by the use of multi-ply carbon rolls feeding transversely across the register, or carbon sheets clipped into position. It is possible to use carbonless papers instead of the manifold set, but these usually require special manufacture and are consequently a little more expensive.

Bank or bond papers are mostly used. Suitable substances would be 45 g.s.m. for all parts up to six, or 49 g.s.m. for the first and 45 g.s.m. for the remaining parts. Many forms are available of standard design, but they are often printed to requirement; each part of the set can be of a different colour. They require to be punched at head, or sprocket punched down the length of the form, depending upon the register and method of feeding employed.

Typewriters

It is fair to say that almost any kind of office document can be typewritten; consequently the choice of paper is governed more by the functional requirement of the document, rather than the machine.

For example; a good quality rag paper substance of 86 g.s.m. could be selected for a commercial or private letter heading, or a cheap quality wood-free bank paper substance of 45 g.s.m. for use as an internal document or copy paper. Either paper could be used successfully. As a general rule, it is not advisable for more than six copies to be made at a time on a manual machine using 45 g.s.m. bank paper with the original, or up to nine copies with an electric machine. It is possible to produce twelve copies on the latter, with the use of manifold bank in a substance of 29 g.s.m. and lightweight carbon paper.

When card similar to the standard postcard weight is used, a copy cannot usually be taken successfully behind the card. In this instance —if a copy is desirable—the copy paper must be placed in front of the card, making the card the equivalent of the copy.

Special purpose typewriters, or attachments, are used for invoicing and similar applications. Stationery for these machines is dealt with under mechanized accounting.

Adding Machines

For these machines, paper is required in the form of a roll or coil. Although various widths are made to suit particular models, ordering is usually straightforward as, generally speaking, all that is required is the make and model number of the machine.

The vast majority of machines use single-ply rolls, but it is possible to obtain two-ply rolls interleaved with one-time carbon paper, or carbonized rolls for producing copies of the listing. Further reference is made in a later section.

Mechanized Accounting

Invoicing Machines: The type of stationery used on these machines can be in many different forms, but in the majority of cases they are operated to the maximum capacity by the use of multi-part continuous stationery. In a typical invoice set the construction would include copies for daybook posting, analysing and despatch note. The set can, of course, be to the customers requirement. The machines are used for purposes other than invoicing and stationery is designed accordingly.

One method of producing the copies is by the use of one-time carbon. In this case the first sheet could consist of 45 g.s.m. bank or 61 g.s.m. bank, and the remaining parts 45 g.s.m. bank. Other methods include carbonized papers and chemically treated papers. The latter while cleaner to handle are usually more expensive.

Certain invoicing machines are only fitted with front feed attachments and are, therefore, only capable of taking either single sheets of paper with a "proof" or backing sheets, or multi-part cut sets. The advantages of this type of set are described fully in another section and it is only necessary to say here that the construction and quality of paper used is similar to that in the continuous set.

Accounting Machines: Choice of paper for this class of machine depends upon the use to which they are put and the specific system operated by any individual Company. As accounting machines are used for purchase and sales ledger posting, stock control, analysis and wages preparation etc., the stationery requirements can be entirely different in each case. The most common application is undoubtedly purchase and sales ledger work, but even for this there is such a wide range of systems and machines available, it is not possible to particularize.

As a rule, three documents must be considered in dealing with ledger posting; statement, ledger card and posting summary or proof sheet. The statement should be of medium quality bond in a substance of 61 g.s.m. and is printed. The ledger card, also printed, should be a minimum substance of 212 g.s.m. in order to withstand the constant handling over a period of one year or more. Also the grain should run across the card to enable it to feed around the platen of the machine more readily. The proof sheet can be either a bank or bond substance and can be plain or printed. Printing of all sheets must be accurate so that the columns on each form are in register with each other. With this arrangement it would be necessary to use good quality heavy weight carbons and that used between the statement and ledger card should have a reinforced edge to facilitate ease in handling.

Various photocopying processes are also used for producing statements which dispense with the need for separate statements and the use of carbon paper. The copy obtained becomes the statement. Such processes are dealt with elsewhere and it is sufficient to state that the materials used will be dependent upon the process employed. It must be remembered however, that appearance and quality of the copies vary according to process; these factors can be just as important as the general economics and facilities of the process.

Another method of ledger preparation involves the use of cards with metallic stripes printed on the reverse, capable of being magnetized. These are used in conjunction with electronic machines and they can hold static information on the stripes, such as customer account number, territory, credit limit, etc., and can also record the detail of each posting as it takes place so that the balance outstanding is automatically brought forward each time the card is inserted in the machine for further posting. These cards are one sided, the visible record being posted on the front of the card.

Automatic Data Processing Equipment

Under this heading is grouped the principal items of stationery used in conjunction with data processing equipment. Data processing is the systematic sequence of operations performed on data, *i.e.*, the merging, sorting, computing, manipulation and filing of data with the object of extracting information or revising it. This is achieved by the use of punched card equipment, computers and associated equipment, addressing machines (used for many purposes other than addressing) teleprinters, etc. All operate by automatic means and largely on the principle of electronics.

In recent years there has been a tremendous advance in the field of electronics and as each new generation of equipment has been developed, it has been made more compact by the micro miniaturisation of the electronic circuits which enables much more information to be handled and at greater speeds.

To obtain the benefits of increased speeds of operation it has also been necessary to develop stationery that will input and output information at a relative high speed to the processing of it. The most common items of stationery are punched cards, punched tape and print out stationery.

Punched Cards: The use of punched cards has developed continuously since the introduction of the first punched card machine some eighty years ago. As explained in previous chapters, the information in various code forms is recorded by means of punch holes.

Equipment using punched cards for automatic data processing is complex and of considerable value. It is not surprising therefore that punched cards are required to be manufactured to very high standards. Until a few years ago, card production was specified by individual manufacturers of the equipment concerned, but there is now considerable standardisation. Card stock is made to a universally accepted specification and, although this is not yet an I.S.O. standard, drafts are in preparation covering aspects such as card dimensions and properties, dimensional interchangeability and many other features.

The card stock is produced from chemical wood pulp which has been found to give the best characteristics consistent with cost. Close limits are set for substance, caliper, rigidity, both with and across the grain, tear strength both with and across the grain, and burst strength. Other physical characteristics of importance and which are also subject to control including the dimensional and flatness stability over a wide range of relative humidity, moisture content, porosity, smoothness, card to card frictional properties, etc. In addition, the cards must be free from conductive particles, translucent spots and brittle areas, holes, creases, wrinkles and surface dust. They must of course punch cleanly.

Card material is supplied to the converter in large reels. These are slit into reels of card width and then fed into high speed printing presses which, after printing, cuts the material into card lengths. Both slitting and cutting operations are carried out to extremely close tolerances—much closer than is the practice in general printing. In addition, corner cuts of various dimensions are made for identification purposes in the punching operation.

Printing inks must be non-conductive, non-abrasive, and must not affect the physical properties of the card in any way that would take them outside the specified limits. They must also dry effectively so that the cards will not block together. Although cards are available in a number of colours, the range can be increased by printing coloured strips along the length of the card.

The most common sizes produced are:—

	Height		Length	
	in.	mm.	in.	mm.
21 column	2	50	$2\frac{3}{4}$	70
36/40 ,,	2	50	$4\frac{11}{16}$	119
38 ,,	$3\frac{1}{4}$	83	$3\frac{11}{16}$	94
65/80 ,,	$3\frac{1}{4}$	83	$7\frac{3}{8}$	187

In addition to being available as single cards they can also be made up into sets with carbon paper, banks and bonds, in pad or continuous form, sprocket punched ready for use in a tabulator or printer.

Punched Tapes: The use of punched paper tapes with automatic data processing installations, originated from its use with teleprinter equipment. It has since developed into an important medium for storage and transmission of data and widely used as a means of "data capturing" by connecting punching facilities to other equipment, *i.e.*, typewriters, accounting machines, etc.

Basic requirements of tapes for both the data processing and transmitting industries are very similar to those for punched cards. Specifications embrace substance, caliper, width, tensile, tear and burst strengths, ash content, hygro expansivity, opacity, conductivity, etc. The tapes must also be dust free and of course punch cleanly. The specifications and tolerances are laid down by the European Computer Manufacturers Association and British Standards.

Tapes may be classified into three principal groups.

Lower Filler Tapes: These are principally used for computer application, where optical readers are employed. As a result the specifications are very tightly controlled, both chemically and physically. Fillers must be reduced to a minimum so that there is virtually no ash or grit content. However, there must be 60–70 per cent. opacity as this is an essential feature where optical readers are employed.

Dependent on equipment requirements some computer tapes can be provided with an oil content which tends to ease punch wear. When oiled the lubricant must be dry and free from migration.

Some low filler tapes are also suitable for mechanical readers.

Parchment Tapes: These can be made from pure vegetable parchment—unoiled, or imitation parchment—oiled. The selection of one or the other depends on the requirement of the punched tape equipment. Those parchment tapes are best suited for telegraphic transmission work where mechanical readers are employed. They are not generally recommended for computer applications since their lower than paper tensile strength can cause breakage, particularly in some operations.

Durable Tapes: These may be special non-laminated paper tapes or, plastic or metallic material laminated with paper. They are used for long life circuitous work requiring exceptional durability and are not normally used for program or data input.

A loop of punched durable tape is used to control the movement of paper through a line printer; this is more desirable than the other types of tape because of the continual wear which the tape receives. Similarly these kinds of tape are used where short lengths are required for constant use by the computer operator to control certain functions within the computer itself.

Tapes are normally produced in three standard widths; $\frac{11}{16}$ in. (17·5 mm.), $\frac{7}{8}$ in. (22·2 mm.) and 1 in. (25·4 mm.) to suit five, six or seven and eight hole channel punching respectively. They are usually available in several colours and can be printed with directional arrows or other symbols for coding purposes. The conventional coil length in the United Kingdom is nominally 1,000 ft. giving an 8 in. diameter coil, wound on a 2 in. diameter bore spool of kraft or plastic.

Print-out Stationery: While punched cards and punched tapes are used for recording results from data processing equipment, results of the processing for many applications are required in printed, legible and readable form. Typical examples are invoicing, payroll and statistical procedures, and there is a diversity of equipment available for this method of output, covering punched card systems, computer systems, addressing machines, teleprinter installations, etc.

Printed results in some cases can be produced on cut sheets of paper, but due to the high speed of operation, stationery in continuous form is necessary if the output is not to be retarded. Requirements concerning stationery will depend upon the equipment and the particular application.

Various types of form feeding devices are incorporated with the equipment so that the stationery is fed automatically and in keeping with the machine speed. Sprocket punching of the forms enables them to be kept in perfect register. Stationery can be plain or printed, and the printed output can usually be arranged to meet any required form design. It is advisable however, for the manufacture to know what equipment is in use. This will indicate important details such as character spacing, number of characters per line, pitch of the characters, etc. Some printers operate at six lines to the inch, others at eight; also the use of double or treble spacing may be advisable in certain applications.

The different types of continuous stationery and size ranges, etc., are dealt with in later sections. Of the papers used in the manufacture of it, by far the most important group are the banks and bonds. The better qualities are made of chemical wood pulp and may be obtained in a wide range of substances and in a variety of colours. The general characteristics of these papers have been dealt with in the appropriate chapter. Essential features in their use for machine stationery are substance, tear, burst and tensile strength. Other equally important factors to be taken into account are folding and dimensional stability, moisture content and conditioning, sizing, filling and loading agents, and opacity. The paper must also be free of all specks, fibrous fragments, blemishes and surface dust.

Substance must be specially mentioned as this is largely dependent upon the speed of the printer. The faster the print-out, the heavier the substance must be to facilitate sprocket feeding, non-tearing at the perforations, ease of refolding after print-out. Even so, paper specifications can vary so much from one printer to another it is only possible to generalize.

For electric typewriters printing at ten to twenty characters a second and tabulators at 150/300 lines per minute, it is possible to use single part stationery in a substance of 45 g.s.m. When operating at 600 l.p.m. a minimum of 49 g.s.m. is required. With modern computer printers operating in the region of 1,000 l.p.m., 61 g.s.m. is necessary for single part stationery, and when approaching 1,500 l.p.m., 73 g.s.m. should be used. For the latest printers with speeds in excess of 2,500 l.p.m. 85 g.s.m. is recommended when in interfold pack form or 73 g.s.m. in roll form. It is possible to use slightly lighter substances than those recommended, but this can reduce the effective operating speed and is in fact false economy.

In the construction of multi-part sets, for most printers 45 g.s.m. is suitable for up to six parts. More important aspects to be considered are the method of holding the various parts together in register, with respective carbons where used, the type of perforation used between each set and the position and registration of the sprocket punching. Many users have a preference for spot-gummed sets, others prefer crimping. These factors must be ascertained at the outset and considered most carefully with the supplier.

It is quite common to manufacture continuous stationery which can subsequently be used as quick-release sets. This entails applying a line of gum down say, the left-hand edge to hold the set together and perforating the paper webs approximately $\frac{5}{8}$ in. in from the edge. The paper is left unglued at the right-hand edge and the carbon at least $\frac{1}{2}$ in. short. Once the continuous stationery has been processed and separated, it is the equivalent of multi-part cut sets, which can be further processed by hand or machine and subsequently separated into individual forms.

Special papers have been formulated to meet the requirements of data processing equipment and banks and bonds are ideally suited for this purpose. To facilitate the negotiation of orders and contracts, most manufacturers will gladly supply test packs for trial purposes. These can then be assessed for quality, freedom from dust, cleanliness, accuracy of print registration, positioning of sprocket and other punching, suitability of perforations, and in the case of multi-part stationery, registration of printing through the set, method of holding the parts together and the efficiency of the method of producing the copies, *i.e.*, one time carbons, etc.

With some applications, the number of copies required may vary. To obviate the need to purchase stocks of multi-part stationery in different combinations, the dyeline copying process can be used, which only requires stationery of single ply. A special translucent type paper is employed. This is obtainable in continuous form and is used for printing out. It is then fed into a continuous dyeline copying machine—the required number of copies are made, which can be automatically delivered and collated into the appropriate sets.

A large number of copies can be produced, by using specially coated continuous paper plates for subsequent reproduction by the offset litho process.

In addition to stationery for tabulating, listing and other procedures, the increasing use of data processing equipment in all fields of industry, has produced demands for other stationery requirements in continuous form. Self adhesive labels for overprinting addresses, codings, identification purposes, stock control details, etc., wages envelopes, tabulator cards, digital graph plotting rolls, to mention just a few, are now widely used. Undoubtedly the range will multiply as fast as the development and introduction of the equipment.

Character Recognition

Special mention must be made of papers used in "character recognition" techniques.

The method of handling and recording information by the use of magnetic ink, was introduced a few years ago by some of the larger English and Scottish banks; cheques and dividend warrants are printed with a magnetic ink code line which can be sensed by machine. As the Clearing banks handle more than nine hundred million cheques a year, it will be appreciated that the electronic equipment used to sort the cheques must be very fast and reliable. Consequently the paper and printing specifications are very exacting.

Reading and sorting of documents printed in magnetic ink is performed at speeds of up to 1,300 forms per minute. The paper must be fairly smooth and reasonably stiff, preferably with a long grain. For all documents passing through banks, a special paper has been formulated called G.B.S.I. This can be either sensitized or non-sensitized, depending upon whether or not it is used for security work. Substance recommended for cheques and dividend warrants is 96 g.s.m., or not less than 0·000425 in. thick. The documents must be within the size range 6 in. × 3 in. and 8 in. × 4 in. and the magnetic ink characters (known as E.13.B. fount) must be printed in a fixed position, with the foot of the characters $\frac{1}{4}$ in. from the bottom edge of the document.

Machine recognition of characters is also achieved by optical scanning using the principle of light reflection. Paper selected for documents handled by this method must be reasonably white and in this respect some of the machine manufacturers specify luminance factors. The recommended substances vary between 60 g.s.m. and 100 g.s.m. The smoothness can be between 100 and 400 c.c/min. and, thickness within the range 0·003 in. and 0·005 in. and should not vary more than ± 0·0005 in. Printing and cutting of the documents must be extremely accurate; for example, the printed image should not be out of alignment more than 0·00015 in. per inch length of printing. The special style of character agreed by the I.S.O. is referred to as O.C.R. "B" fount.

Time Clock Cards

Time recorder cards are produced to exacting specifications laid down by the time clock manufacturers. The furnish of the material is usually sulphite wood pulp. Close limits are set for substance, caliper and rigidity. In the main the board must be on the "hard" side with rigidity being absolutely vital. It is also essential that the board is properly conditioned to ensure dimensional and thickness stability in varying climatic conditions. If the cards absorb moisture and swell, they would not fit accurately into the slot of the recorder; if they lose moisture and contract, the clock stampings will not fall accurately into position. All time cards are printed so the material must accept ink, which means that sizing, finishing, calendering, etc., have to be carefully controlled.

Printing and cutting must be absolutely accurate to give dead register in the time clocks. Cards are made in standard widths according to model of clock; very small tolerance is allowed over and above these standards. This is $\frac{1}{64}$ in. on some widths and as little as 0·005 mm. on others. In order to obtain these fine limits accurate rotary cutting is essential. The grain of the material must run from top to bottom.

Buff manila is most popular, but white and a small range of colours are obtainable and often used for identification between departments or factories.

Storage

Care and control during manufacture of any stationery supplies is wasted unless similar care is taken in storing, handling and use. It is desirable that extremes of temperature and humidity are avoided. Wherever possible supplies should be kept within the environmental area of the equipment, thereby limiting any change between extremes of storage and operative location.

2. Carbon Papers

Manufacture

This is covered in the chapter on paper generally. For reference, however, it is repeated that these papers consist of a thin base paper coated on one side, which then transfers under pressure to the surface of another paper. The quality of the base paper, coating and manufacture determines the characteristics on which the eventual use depends, and it is with these factors that this chapter is principally concerned.

Pen and Pencil Carbon

As a rule, this is softer than other types because it depends on pressure rather than percussion to produce a copy. There are two basic types—*pigment*, which is clean but not brilliant, and *oil soluble*, which is brilliant and good for manifolding, but is not clean and is inclined to stick to the copy. With some makes all the virtues of both pigment and oil soluble inks have been successfully combined to give a carbon which is brilliant, durable and non-tacky.

Typewriter Carbons

The majority of papers of this type are for standard and noiseless machines. Papers for the latter are more sensitive because the mechanical blow of the type bar is more gentle. A well-balanced carbon, however, will be suitable for either category of machine.

The factors which comprise quality in carbon paper are as follows:—

(1) Uniformity.
(2) Cleanliness in handling.
(3) Cleanliness and neatness of work.
(4) Manifolding power.
(5) Ease of handling.
(6) Resistance to curl.
(7) "Unbroken" copies.
(8) Permanence.
(9) Adaptability.
(10) Appearance.
(11) Durability.

In addition to quality of materials and workmanship, the above factors are governed by two things—writing strength and weight. Carbons are made in various combinations of weight and writing strength, each of which will stress one or more of the factors listed above, sometimes at the expense of one or more of the others. The technical characteristics of the tissue and coating are such that no one carbon can possess, in an equal degree, all of the desirable properties. In practice, therefore, the choice of carbon paper must be made for each application, being based upon the best possible compromise of the various properties as they apply to the particular application.

In general, it may be said that:—

(1) All carbons of good quality give a permanent impression.
(2) Appearance is a matter of taste. The appearance of the carbon sheet itself is of little consequence when considering its practical application.
(3) A soft finish gives a dense and darker impression.

(4) A soft finish is more inclined to smudge or offset from tight feed rollers.

(5) A soft finish will usually be better for manifold purposes because it is more sensitive, but this is not an infallible rule.

(6) A normal finish is nicely balanced to meet the desires and needs of the average user. It is neither too dark nor too light in colour, and frequently manifolds better than harder or softer finishes.

(7) A hard finish is harder of surface and greyer of impression.

(8) A hard finish is more often inclined to curl. This is usually caused by moist weather or quick changes in temperature, as from a cool stockroom to a warm office. Storing all carbon flat will alleviate this condition somewhat.

(9) A hard finish is often more durable.

(10) A hard finish will write more clearly.

(11) A hard finish is cleaner to use and to handle.

(12) A lighter weight is better for manifolding.

(13) A lighter weight produces characters of sharper outline.

(14) A medium weight can often be used either as a general correspondence carbon or as a manifolding carbon. Its sharpness almost duplicates the work of a light weight, and it is somewhat easier to handle.

(15) A medium weight can be used in heavy manifolding when heavy billing or electric typewriters are used.

(16) A standard weight is less likely to curl or wrinkle.

(17) A standard weight is easier to handle.

(18) A standard weight is more durable.

From the above, it can be seen that the best recommendation is the heaviest weight and the lightest impression that will do the particular job satisfactorily. A concession in weight sacrifices wear, and a concession to darker writing sacrifices cleanliness.

A table showing the weights and finishes available in an average range of carbon papers is as follows:—

Weights: Light weight for 7 or more copies.
Medium weight for 1–6 copies.
Standard weight for 1–4 copies.
Heavy weight for 1 or 2 copies.
Extra heavy weight for single copy correspondence and billing.

Finishes: Hard finish (for sharp, grey copy).
Normal finish (for sharp, black copy).
Soft finish (for intense, black copy).

Other Machine Carbons

For use with various typewriter attachments designed for invoicing, etc., on continuous packs of forms, billing carbons, specially made up to be accommodated by such attachments, are available. For example, fanfold-style carbons are 24 in. long, coated 18 in. with a 6 in. uncoated portion ending in a loop, through which a metal strip on the attachment is fitted. It is this strip that pulls the carbon away from the set already typed and positions it correctly in the next blank set ready for typing.

Accounting machines generally use a heavy-weight carbon made on the strongest tissues, to withstand the heavy type-action of the accounting machine. Carbons of this type are often made in sewn binder form—*i.e.*, a sheet or sheets of carbon stitched to a manilla paper backing sheet, to allow for ease of handling and registration of ledger cards, statements, journal sheets, etc. in accounting systems.

One-time carbon or hecto carbon (dealt with below) is often supplied in continuous fanfold-style packs, "married" to plain or printed copy paper or master paper. These packs may also be sprocket-hole-punched for use with tabulators or computer high-speed printers.

One-Time Carbon

This is a thin and comparatively cheap carbon which is intended to be thrown away after use. Its use is to make up interleaved sets of forms which can be inserted into a machine without individual collating of forms and carbons. Such sets can be made up in a variety of ways and have the following advantages:—

(1) They save a considerable amount of time, as they are ready for immediate use;
(2) The required number of copies is always made;
(3) Unused carbons in each set ensure clarity of copy;
(4) Copies can be of different sizes from the original, which facilitates non-reproduction of certain data;
(5) They are clean and easy to handle.

There are several methods of fastening the required number of forms and carbons, which are explained in a later section.

Spirit Duplicating Carbon

Also known as hectograph carbon, this is used for making "master" copies from which "run-off" copies are taken on the machine. There are two ways in which it is used at the moment—single sheets and master sets.

Until comparatively recently, the one disadvantage of an otherwise economical, speedy and simple method of duplicating has been the dirtiness associated with the carbons used for preparing the hecto master.

This has now been largely overcome with the introduction of hecto carbons with the ink surface overcoated with a sealing compound, thus making them clean to handle. This virtue of cleanliness has now been extended to the formation of some of the inks themselves, notably, blue and black hecto.

Master sets combine hecto carbon and master paper in one set. Clean edges both top and bottom protect the hands, which need never touch the hecto carbon. They can be pre-printed with form outline and constant detail, leaving only the variable information to be typed or written in. Perfect registration of the run-off copies is thus guaranteed. The master is ready for instant reproduction—no loose carbon sheets, no printed copy forms, no assembling, no aligning—and it speeds production, reduces paper work and saves money, time and man-power.

The approximate number of run-off copies from each master can vary from 50 to more than 250, according to quality. The master sets are normally available in 8, 10, 11, 13 and 14 in. stock depths of coating. The measurement along the hinge (always quoted first) can, of course, be any length required.

Photocopying Carbon

This is usually yellow or orange in colour and is used as a backing to a document required for subsequent copying on diazo equipment. The yellow or orange deposit of carbon on the reverse of the typed document intensifies the opacity of the characters and thus helps to speed up the copying process.

Carbon Rolls

Carbon paper in roll form has long been recognized by some machine manufacturers as a means of making their equipment more speedy and economical in use. Indeed the original conception of some machines is based upon carbon rolls—*e.g.*, the familiar desk register which uses packs of continuous stationery and depends upon the plies of a carbon roll for the various copies.

The carbon paper is of many different qualities. Some idea of the diversity may be obtained from the following.

Pencil Carbon: For desk or portable registers, with varying number of plies in a roll. Also for certain addressing machines, and cross-feed attachments on addressing machines for taking carbon copies. *Billing Carbon:* For accounting machines to avoid use of loose carbon sheets, and for creep feeding on tabulators, thus dispensing with the use of one-time carbon interleaved with continuous stationery. *Hecto Carbons:* Used on special typewriters, obviating the need for loose sheets of hecto. Also for teleprinter rolls, where several copies of the original message are needed. *One-Time Carbon:* For adding and accounting machine tally rolls and teleprinter rolls.

Carbonized Paper

A further development of carbon paper is a typing or writing paper coated with a thin carbon deposit on one side. This paper is used as the original and avoids the necessity for inserting carbon paper. The entire sheet may be carbonized, or only parts of it. The latter method is employed where it is necessary to reproduce only certain information on the underlying copy. The carbon coating can be applied in any position, shape or colour, but because of its application absolute registration is important. This type of paper has a tendency to dry over a period, so that storage is a major consideration.

Its advantages are:—

(1) Only certain information can be reproduced, according to the positioning of the carbon deposit.

(2) Time is saved, as the need to insert and position carbon paper is eliminated.

Carbonless Copying Paper

Chemically treated papers which under pressure reproduce copies, are used for the same purpose as one-time carbon in the making of single and multiple sets of forms and continuous stationery. Generally more expensive, its use cannot be ignored when dealing with this type of business.

Waxless or Solvent Carbon

This is the latest development in the manufacture of carbons. Whereas the conventional carbon papers described already are made with a wax-pigment coating, these new carbons do not contain any wax and use instead a microporous plastic coating impregnated with a quick-drying ink. This coating is applied to an extra strong base tissue, or alternatively to a resilient film material. Waxless or solvent coatings do not flake off or wear into bare patches, and therefore these carbons can be used long after conventional carbons are discarded. Other advantages are:—

(1) clearer copies, because the coating wears down evenly and prevents broken outlines to the characters;

(2) cleanliness, as there are no particle deposits or dirty finger marks; the copies are smudge-free because the ink penetrates the copy paper;

(3) the extra strength and wearing qualities give an all-round performance with every variety of typewriter;

(4) these carbons are particularly successful with electric typewriters and accounting machines or any hard wear when typing repetitive layouts;

(5) wastage of materials and time is reduced.

These waxless carbons are usually supplied in two weights: lightweight, suitable for taking 6 to 8 copies; standard weight, for up to 4 copies.

Carbon Complaints

Carbon complaints are usually found to have their causes in the wrong uses to which the carbons are put, and a knowledge of conditions is therefore necessary in order that matters may be satisfactorily adjusted.

Some machines of the same make and model produce vastly different results, while operators also vary in the force of their stroke. The nature of the work is a great factor, as is also the quality or weight of the letter paper used. If complaints are received, consideration should be given to all these points as well as to the individual likes or opinions of the user. It is also well to remember that a new typewriter platen or roller is very often the cause of complaints. If a new or soft platen is used, the carbon copy is apt to be light in depth, though broader. Therefore a strong writing carbon is recommended.

Offsetting is generally caused by the paper feed rolls being too tight, which is more apt to cause trouble when a heavier paper is used or manifolding work is being done.

Treeing or *wrinkling* of the carbon sheet in the machine is of course, more apt to occur when light-weight or manifolding carbons are being used, but the blame cannot fairly be laid upon the carbon. The cause of the trouble may be attributed to any one of the following:—

(1) The carbon sheet not having been inserted evenly with the rest of the papers;

(2) Failure to insert the whole evenly into the machine;

(3) Unequal pressure of the feed rolls or the carbon having become wrinkled when lying loose on the desk.

To avoid this trouble, the feed rolls should be loosened after the work is inserted in the machine, so that any unequal tension of the paper and carbon may be adjusted. Use of a backing sheet with a fold-over top is also helpful.

Variation in Backs. Comment is frequently made regarding the variation of shade or depth of colour in the backs of carbon sheets, in the belief either that the particular quality is defective or that the wrong quality was supplied. This is not so. The cause of back variation is due to the tissues varying in thickness and absorbency, thus regulating the degree of ink saturation into the tissue. "Ageing" is another factor. The backs of most carbons will darken with age. When it is borne in mind that all good papers—*i.e.*, those made of selected rags, linen, hemp, etc.—represent a very wide variety of materials gathered from all sources, reasonable allowances must be made. The variation in the back has, therefore, but a very slight effect on the writing qualities of the carbon.

3. Inked Ribbons

Manufacture

Generally, ribbons are made of fabric—either silk, nylon or cotton. Every care is taken in their manufacture to ensure even printing, durability and good colour. Ribbons differ in strength, in the structure of the weave and in their ink-transfer properties.

The finest quality fabric ribbons are made of silk or nylon. They produce very sharp impressions and are extremely durable. The quality of typescript produced by one of these ribbons is distinctly superior to that produced by a cotton ribbon, and for this reason alone they are well worth the extra expense when the finished result matters. The best cotton ribbons are woven from fine, long cotton-fibres, which ensure strength and fineness. This quality of fabric generally has about 280 threads to the square inch. After testing for grade, thread count, purity and strength, it is cut to the appropriate ribbon widths, edged, and then reeled ready for inking. Inking is a most delicate process, especially as the degree of inking must always be uniform; in the case of two-colour ribbons, the inks must be separated with hairline precision. The inked ribbon is wound on to spools and cut to length as required.

Ribbons can be supplied with either light, medium or heavy inking. Medium is standard. Light inking produces a finer, sharper character, but for certain applications a ribbon with heavy inking, producing intense, broad characters on the page, might be best.

Among the various factors to be considered are the number and quality of copies wanted. It will be evident that a fine-caliper silk ribbon will produce sharper carbon copies than will a heavy gauge cotton ribbon. Also to be borne in mind is the type style. For example, a small elite type will demand a lighter inking than a large bold-faced type.

Typewriter Ribbons

There is an almost limitless variety of machines used in modern offices, all dependent upon inked ribbons, but again, those for a typewriter are the most common.

The following are the requisites of a good ribbon:—

(1) Neatness of impression.
(2) Permanence of impression.
(3) Non-type filling.
(4) Resistance to drying out.
(5) Minimum "break in" period, so that impression of new ribbon will not smear.
(6) Durability.
(7) Brilliance of colour.
(8) Ease of erasure.
(9) Recuperation.

As in carbon paper, there are two things in addition to quality of materials and workmanship that determine the results from a ribbon:—

(1) Type of fabric used.
  (*a*) Silk.
  (*b*) Nylon.
  (*c*) Fine cotton.
  (*d*) Heavier or coarser cotton.

(2) Inking strength.
  (*a*) Light.
  (*b*) Light medium.
  (*c*) Medium.
  (*d*) Medium heavy.
  (*e*) Heavy.

The type of fabric and the inking strength must be determined by the sort of work expected of the ribbon. The satisfaction of the customer depends upon the salesman's success in recommending the best ribbon for the work in hand.

Many buyers mistakenly rely on thread count in purchasing ribbons. Thread count can, however, be deceptive, It is true that the closer the weave of a cotton ribbon the sharper is the outline of the characters written, but at the same time this makes the fabric more brittle and reduces the capacity of the ink reservoir. Of equal importance for best results are the number of fibres per thread, the number of twists in the thread, the bleaching process, the absorption of the cloth, the strength of the fabric and the chemical formula of the ink.

In general, it may be said that:—

(1) The sharpest and clearest work is done by silk, nylon or superfine cotton ribbons.
(2) These are also less inclined to fill the type or to smudge, and have practically no "break in" period.
(3) The finer the cotton, the cleaner and clearer the work.

(4) For some types of work the heavier cotton may be more durable because it is not so tightly woven.

(5) Coarser cotton will hold more ink.

(6) The lighter inking strengths are cleaner and neater.

(7) The lighter inking strengths are easier to erase.

(8) The lighter inking strengths are less inclined to fill the type.

(9) Heavier inking strengths are more durable.

(10) The smaller the type face on the machine, the lighter the inking recommended.

It could, perhaps, be more widely known among business people that the appearance of their correspondence can be immeasurably improved by using fine cotton, pure silk, or nylon ribbons. Such fabrics, impregnated with carefully formulated fluid inks, not only give an "executive" appearance to letters from first use, but very often prove more economical on account of their recuperative powers and the extra length of ribbon per spool.

Various lengths of ribbon are available. For standard typewriters they are generally 12 yds. long, but for portables the figure varies from 6 yds. up to the full length of 12 yds. Short ribbons cost less, and those over $\frac{5}{8}$ in. wide usually cost more than the standard price. Most typewriters are fitted with a $\frac{1}{2}$ in. wide ribbon, but the precise width varies slightly according to make. Silk or nylon ribbons can be spooled 16 yds.–24 yds. long owing to the fineness of the fabrics.

Other Machine Ribbons

Special ribbons are made for accounting machines, adding machines, cash registers, addressing machines, cheque writers, teleprinters, time recorders, computers, etc. The widths, lengths, colour combinations and spools vary considerably, and the fabrics and inkings are carefully tailor-made according to the machine requirement and application. Included in these are acid-proof inkings for cheque-writers, waterproof inkings for laundry-marking machines, and hectograph or copying ribbons still required by the legal profession.

Plastic Ribbons

Electric typewriters are sometimes fitted with plastic ribbons, made to a special formula by a special process. They are used once only, and are coated with a dry ink, so that there is no "splash" of ink beyond the limits of the character (as must occur with fabric ribbons). The whole object is to give the maximum possible fidelity of reproduction. A plastic ribbon would be considered for high-prestige correspondence, or for the preparation of material to be reproduced, particularly by the litho offset process.

Paper Ribbons

With the advent of plastic ribbons, carbon paper ribbons, as such, are rapidly dying out, with the notable exception of paper-based hecto writing ribbons mentioned below.

Spirit Duplicating Ribbons

There are typewriters on the market specially designed for creating hecto or spirit duplicating masters. The idea of these machines is to dispense with the handling of sheet hecto carbon by providing the carbon in paper ribbon form, generally $\frac{5}{16}$ in. wide by about 100 yds. long. These ribbons are now available with an uncoated selvedge on either side, thus making for complete cleanliness in handling.

Offset Reproduction Ribbons

These differ from ordinary record ribbons in that they are made with a special greasy ink for typing direct on to paper or metal plates used in offset lithographic printing. They are supplied in superfine cotton or silk, and carbon paper or film in reels.

Photocopying Ribbons

These are made with pigment-loaded inks, often with a yellow content, to create a master of the maximum opacity for copying by the various diazo processes. They are also obtainable with special inkings in colours for heat-process copying machines.

Ribbon Complaints

Just so long as ribbons are used on typewriters and other printing machines there will be complaints, but most complaints can be traced to outside influence and can be adjusted without condemning the ribbon.

Operators differ materially in likes and dislikes. This is also true regarding "touch," some striking much more heavily than others. Also the machines, even those of the same make, will frequently differ very greatly in printing qualities.

Uneven inking is one of the most common complaints, yet with the method of making ribbons this is practically impossible. It is generally the result of an irregular ribbon feed, causing the ribbon to be used to excess in spots before the tension acquired again sets the ribbon in proper motion.

Should the ribbon copy be uneven, a good way to tell what is at fault is to make a carbon copy. If the carbon copy is also uneven, then it is safe to assume that the fault lies in the typist's touch, but if the carbon copy is even, then the fault undoubtedly lies in the ribbon feed.

Most "touch" operators will strike more heavily with certain fingers and upon certain type characters than others, and this they may or may not realize. The difference of "touch" will naturally make a difference in the writing, which is at times attributed to "uneven" inking of the ribbon.

When operators are using a new ribbon or carbon paper, closer attention is generally given, and inequalities or imperfections are noted which in their previous work had been disregarded.

Type filling is frequently caused by erasure dust accumulating in the type, though just as often by the use of a too-heavily inked ribbon. (A lightly inked ribbon should always be used for elite or small type.) Improperly prepared or cheap inks tend to justify this complaint.

Too light or too heavy. Ribbons not producing the desired writing strength when put on the machine generally indicate an improper selection to meet existing conditions. Cheap inks are apt to dry with age, and cheaply-made ribbons cannot be depended upon for uniformity.

Incorrect Bi-colour Division. The two colours printing where only one should show is generally due to the ribbon guide failing to rise to the proper extent, either as a result of a faulty adjustment or through an accumulation of erasure dust interfering with the action. By careful measurement it can be ascertained whether the ribbon is at fault.

Defective Ribbons. A complaint that a ribbon is defective without any further explanation or comment is hardly fair, as it leaves the manufacturer with no choice but to take the customer's word without an opportunity of locating the trouble.

4. Paper Rolls and Coils

Many of the business machines in use today require a paper roll or coil on to which is printed the data produced by the machine. These may be in the form of single-ply rolls, multi-ply interleaved with carbon, carbonized rolls, or no carbon required paper. They may be printed or plain, and can be supplied in white or pastel colours. For some machines, such as addressing machines or postal frankers, they may also require to be gummed.

The quality of paper will also depend on the requirements of the machine, particularly where "fluffing" is to be avoided. The cheaper grades are made from mechanical MF Printing—not dissimilar to newsprint. Where handwritten information is required, a wood-free paper is used, while for detail and audit rolls used in cash registers a good quality manifold paper is called for. The cash register producing receipts, or machines designed to issue tickets, require a bulky ticket paper.

Where more specialized application is involved, vegetable parchment, litho paper, brown kraft heat seal and impact adhesive papers are used.

For the machines more widely used, such as adding machines and cash registers, the paper rolls may well be stock lines, whereas for specialized machines they are either only obtainable from the maker of the machine or produced by special order to specific details. To obtain the correct roll it is desirable that the information given to the supplier includes quantity, type and make of the machine for which the roll is intended, width and diameter of roll and internal diameter of centre core. A sample of the paper and of the centre core will further help to ensure the correct roll being supplied.

The fitting of the roll to the machine is important, as are also the machine manufacturer's instructions. Cash register rolls often have the maker's loading instructions stamped on the end of the roll. On most rolls a coloured warning mark is printed towards the end of the roll so that the operator is made aware that the roll needs changing.

5. Single Form Stationery

The term Single Form Stationery can broadly be defined as "all types of commercial and industrial forms whether plain or printed, paper or card substance, in any size, which is complete in itself and does not constitute part of a multi-part cut or continuous stationery set or roll and is in the form of a single sheet."

With this in mind, the reader could be forgiven for thinking the scope of Single Form Stationery limitless, were it not for limitations imposed by standard paper sizes, standard filing equipment, and common sense.

When asked to supply a new form, the stationer should try to obtain as much information as possible with regard to its use. The amount of handling, the conditions in which it will be used, and the life of the form can all have a bearing on the quality and substance to be recommended. The size of the document should be such that it can be economically cut out of a standard paper size with due allowance made for cutting, trimming and gripper margin if printed; an additional allowance may be required if the printing "bleeds off," *i.e.*, extends to the edge of the form. In addition to paper sizes, the method of filing, type and make of file, and filing equipment, can also determine the finished size of the form. If punching is required the exact specifications of the filing equipment must be obtained in order to punch the appropriate holes in the correct filing margin. This is extremely important for different sizes of single form stationery assembled for combined entering on two or more related forms.

Standard sizes and lay-outs for the more conventional business form are referred to in section 12 of this chapter. The basic essentials of good form design are economy of paper and simplicity of lay-out. These two factors alone can save time and money in the office system.

Economy in paper is achieved by using the minimum size necessary for the form and selecting the correct weight and grade compatible with the overall requirements of the system. Simplicity of layout covers such things as ease of entry of the required information in a logical sequence, combined with clear and well proportioned typographical design.

6. Multi-Part Cut Sets

The majority of paper work in any business usually demands at least one copy of the original and very often two, three, four and even more. While copies are easily produced with the use of carbon paper, the task of collating and interleaving is laborious and time consuming. Multi-part sets of forms are collated and fastened together at the manufacturing stage. They are made in such a way that forms and carbon are easily detachable in one operation after use, thus obviating a further disadvantage of each individual sheet having to be de-collated. The general advantages obtained from the use of such sets are as follows:—

(1) They save considerable time and effort.

(2) The required number of copies is always made.

(3) Each set contains unused carbon paper or other means for producing the copies.

(4) Copies can be of different sizes from the original, which facilitates non-reproduction of certain data.

(5) They facilitate the spread of peak work loads over a number of typists.

(6) They are clean and easy to handle.

Types

There are several different types of multi-part sets, each of which produces the copies in slightly different ways.

One Time Carbon Sets: One time carbon paper is a cheap type of carbon made specifically for set work and designed to be used once only and then disposed of. It can be placed into position in a non-interleaved set prior to use, but it is customary for interleaving to be done at the manufacturing stage.

Carbonized Sets: The individual forms are themselves coated with carbon on one side. Carbonizing may be over the entire form or in selected positions. The latter is useful where it is necessary to reproduce only certain information on the copies. Accurate registration in this case is particularly important.

Carbonless Sets: These are made up from chemically treated papers, which do not require the use of carbon paper or carbonizing, for producing the copies. Although eminently suitable for set work, it is essential that these sets are stored and handled with care to prevent spoiling of the forms, as any pressure will produce a mark on the copy sheet.

Methods of Fastening

The usual methods of fastening the required number of forms and carbon when used, are:—

Tip Glued: Forms are glued along one edge with a flexible type of glue, usually the latex variety. It is a suitable method where the forms do not require too much handling. Separating is simply by peeling the forms apart.

Stub Glued: Instead of glueing the edge of the form, glue is applied to the surface of the form near to the edge, providing a stub next to which the forms are perforated. This method allows more handling of the set, enables the sets to be reinserted into the machine several times, and copies to be detached from the remainder of the set speedily.

Quick Release Sets: These are sets glued, perforated and made, so that separation is even further speeded up. The carbons can be attached to the stub, but shorter than the forms; by holding the stub and pulling the bottom of the forms, the latter are separated from the set leaving the carbons attached to the stub. Alternatively, if the carbons are left free from the fastening and are longer than the forms, they can be withdrawn from the set, leaving the set ready for separating as and when required.

Uses and Ordering Considerations

Sets can be used for a variety of systems. For example: ordering processes, preparation of invoices, storage issues, goods delivery and received notes, stock replenishment, contracts of various types, sales forms, memos and inter-departmental forms, etc. In fact any system where one or more copies are required for distribution or retention by the originator.

Although sets can be made by hand and certain automatic machinery, specialized equipment is used for economic production. Such machinery is limited to certain styles and sizes of set. It is impossible to detail a list of these limitations as they vary from one make to another. It is, therefore, important that any manufacturer is given the opportunity to comment on the required design, so that if necessary slight modifications may be considered to enable manufacture on a particular type of machine.

So that the correct specification of style, paper and carbon quality can be arrived at, the following considerations are necessary when handling orders or enquiries for multi-part sets:—

(1) Is the set of forms to be hand-written, typed, or for use with any other office machine?

(2) If it is handwritten it must be realized that the number of copies obtained will be limited, and therefore generally speaking the more copies required the thinner must be the paper. This is a good principle to observe on all types of sets.

(3) Is it necessary to include one-time carbon or will loose carbons be inserted at the time of use?
To insert carbons each time an entry is made will reduce the cost of the sets, but will also slow down the operation very considerably.

(4) Would the user prefer one of the chemically treated papers which eliminate the need for carbon?

(5) Is there to be any part of the entry that does not need reproduction on any of the copies? If so, this can be achieved by having either an irregular cut out shape on the carbon, desensitizing certain areas on chemically treated papers, or by employing paper carbonized only in the required areas.

(6) Is hot spot carbonizing required on any copy to produce a signature receipt?

(7) Are perforations required for detachable portions such as receipt or acknowledgements?

(8) What sort of file punching is wanted and on how many of the forms?

(9) How are the sets to be numbered?

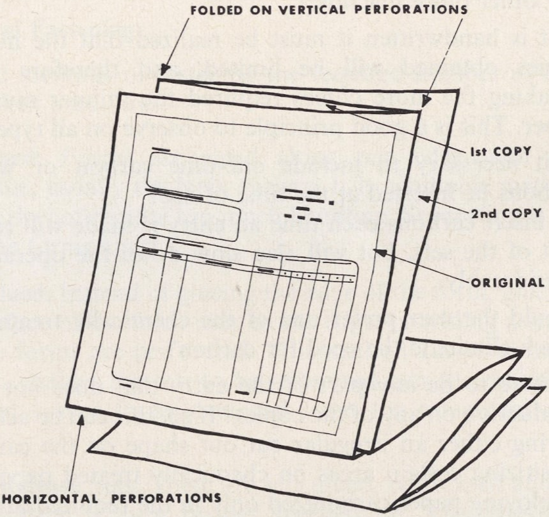
(10) Is that extra copy (just in case) really necessary? It will cost more.

(11) How frequently will repeat orders be placed? This can have a bearing on the method of printing to be employed.

(12) Is the set completely dispersed after the initial entry, or is there to be some means of holding copies together for subsequent use?

7. The Development of Continuous Stationery

Continuous stationery is often thought of as a comparatively recent addition to the range of office aids. In fact, the first patent application for a continuous stationery register was filed in the United States in 1882. The original machine used rolls of paper which were mounted separately in the framework and were brought together at the point of writing. Around 1910 the first "fanfold" forms were developed. These consisted of a wide strip of paper perforated across its width and down its length and afterwards folded into "accordion" pleats.

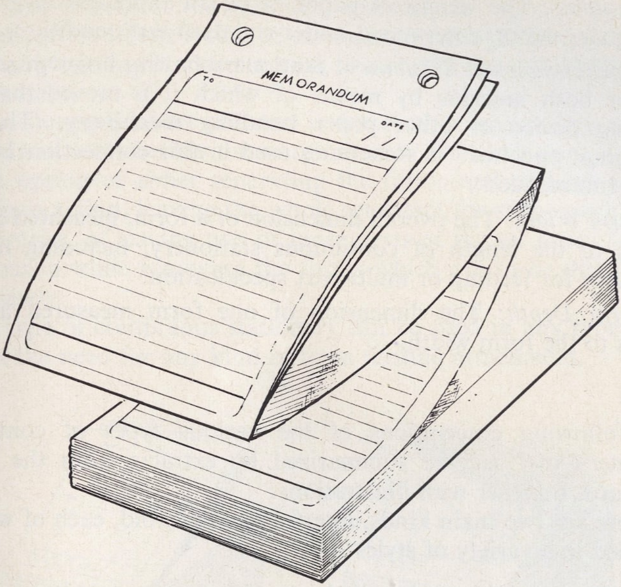


Fanfold Forms.

This form of stationery was first used by drawing the form over a writing platform with pieces of reproducing material held in place at either side in such a way that they were projected into the set.

This development was rapidly followed by continuous perforated strips in interfolded form. The original and each copy were printed on to a separate strip of paper which was then interfolded into a zigzag pack (see Fig. 2).

Rolls have, of course, long been discarded, but fanfold and interfold stationery over the whole of the intervening period have been developed intensively for an ever-increasing range of applications. At one end of the scale continuous stationery is used in the sales register on the counter of a local shop. At the other end it feeds the fastest output printers of modern computers. In the course of this development interfold stationery has proved itself the most useful and adaptable style, and fanfold is now less and less used. Continuous stationery was first developed to cope with the problem of producing the copies without which no business can function. It has proved itself the fastest, simplest and most efficient method of dealing with vital paper work routines demanding repetitive and speedy production of an original and one or more copies of a form. Its efficiency depends on the fact that whatever the means of reproduction—handwriting, typing or other machine—once the first



Interfold Forms.

"set" in the pack has been set up, each form as it is completed and removed pulls the next set into place, thus eliminating all peripheral operations such as turning pages, inserting carbons and aligning forms. This leaves the operator free to concentrate on the main job, which is, of course, entering the forms. Invoices, delivery notes, counter sale slips and purchase orders are only some of the more common and obvious applications. It is unusual today to find a sizeable company that is not using continuous stationery in one form or another.

8. Types of Continuous Stationery

Definitions

General definitions applicable to continuous stationery, and as detailed in the appropriate British Standard, are as follows:—

Continuous Stationery: Single or multiple forms joined into a continuous length.

Set: An individual document which comprises one or more layers of paper (parts). In certain instances the make-up will include copy-producing material.

Pack: Continuous stationery perforated and folded at regular intervals in concertina fashion.

Substance: The weight of paper or board expressed in grammes per square metre, determined under standard test conditions.

Sprocket-punched Stationery: Stationery having holes punched in one or both margins by means of which it is moved through a printing device or other paper handling machinery. (The term "marginal punched" is sometimes used in this connection but it is not recommended.)

**Form Width:* The overall dimension of a form, measured at right angles to the length of continuous stationery, including margins necessary for feeding or multi-part specification.

**Form Depth:* The dimension of one form measured at right angles to the form width.

Types

The following descriptions of the various types of continuous stationery can best be summarized by extracts from the British Standard, together with illustrations.

There are two main kinds, interfold and fanfold, each of which is supplied in a variety of styles:—

(1) For use with anchored sheets of carbon paper.
(2) Interleaved throughout with continuous carbon paper.
(3) Carbon backed.
(4) Using special papers which under pressure reproduce copies.
(5) As above but with holes punched along the margins of the paper for use with sprocket-feed devices.

In addition, continuous stationery can be supplied in rolls.

For Use with Anchored Sheets of Carbon Paper: Interfold consists simply of separate continuous lengths of forms, usually of different coloured paper, brought together and interleaved one behind the other and folded concertina fashion into a flat pack. The forms may be all the same width, or of various widths so that unwanted data can be omitted on such copies as delivery notes. Extra cross-perforations on one or more copies can be employed to provide address labels. The carbons, anchored to the continuous form feed device, are laid between the forms.

Interleaved Throughout with Continuous Carbon Paper (One-time Carbon): This type consists of interfold stationery, pre-interleaved throughout its whole length with a thin carbon paper which is commonly referred to as "one-time" carbon, a designation which is self-explanatory.

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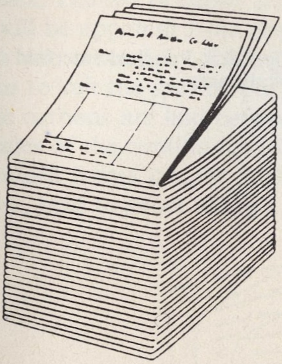
* These definitions allow for the British practice of folding and orientating for use along either the top or side edges of the paper, and hence do not always coincide with the international I.S.O. definitions of width and depth.

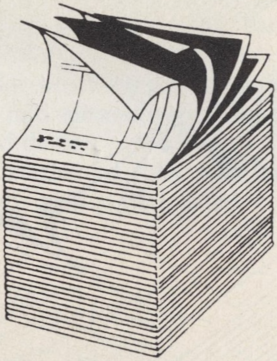
This type of continuous stationery and also the sprocket-punched one-time carbon interleaved type can be supplied with the continuous forms held together in various ways to suit customer or application requirements.

As each completed set of forms is detached, it remains intact with its carbon securely held in the marginal stub. The clerk or typist then has the option of either separating the forms and carbons with a quick snap action, leaving the whole set intact for subsequent additional entries, of leaving two or more parts of the set intact for the same reason while removing the forms which are to be distributed immediately.

This type of continuous stationery can be used in any typewriter without the need for any kind of form feeding attachment.



Interfold Stationery.



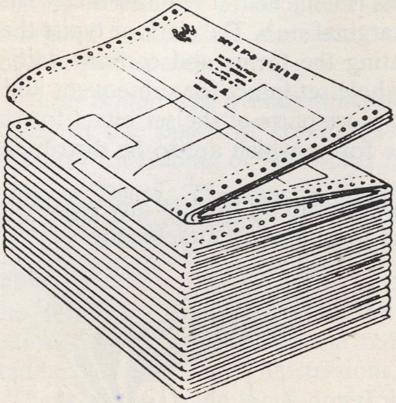
Interfold Stationery with One-time Carbon.

Carbon Backed: This kind of continuous stationery is an alternative to that operating in conjunction with an anchored carbon paper device or one-time carbon paper. The difference is that instead of one-time carbon lengths being used, a carbon deposit is applied to the back of all but the last form in each set. The carbon can be coated over the whole area of the form or it can be applied in panels patterned behind the parts on which data will be typed or written. Ideally a clean, hard carbon surface, which only yields to the sharp impact of a typewriter type bar or the firm pressure of a pen or pencil point, is necessary.

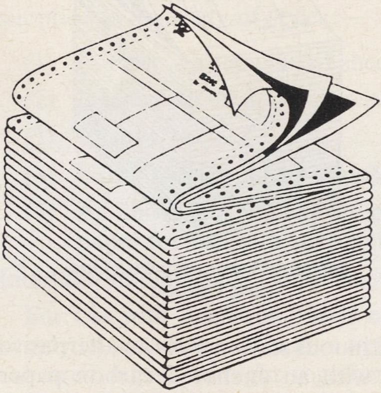
The ability to apply the carbon deposit in any chosen position on the backs of the forms is an advantage. Not only does it minimize the area of carbon required, but the carbon can be omitted from those portions of the form which have not to be copied.

This type of stationery can be supplied in a continuous length, with or without a pasted stub.

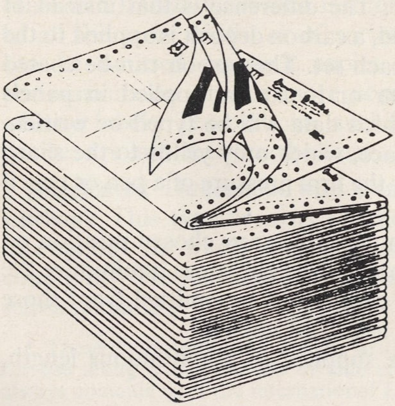
Papers Requiring No Carbon: A further alternative to the use of one-time carbon or carbon backed paper is provided by using special papers which, under pressure, reproduce copies. Such papers are clean to handle and eliminate the need for carbon paper.



Sprocket Punched Interfold Stationery.



Sprocket Punched Interfold Stationery Carbon Interleaved.



Sprocket Punched Interfold Stationery Carbon Backed.

Sprocket-punched Stationery: This stationery is punched with a succession of small holes at regular intervals along its entire length in both left and right margins. It can be used with some anchored carbon paper devices, or with continuous or one-time carbon paper.

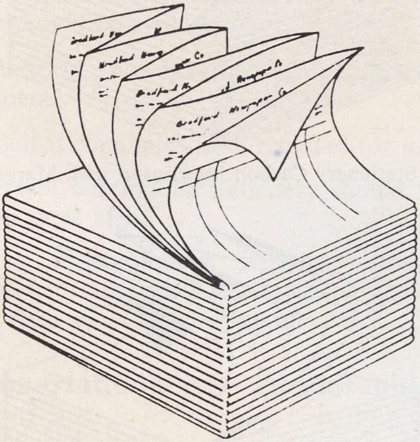
Fanfold Stationery

Fanfold is a different style of stationery. Instead of separate lengths of different papers being interleaved, one length of a single wide sheet is used. The various forms in the set are printed across the sheet, alternatively on the front and back of the paper, often each in a different colour of ink. The sheet is then folded across the width in register with the printing, each fold being perforated for subsequent separation of the copies. The length is then treated in exactly the same way as interfold and folded zig-zag fashion into a flat pack. The sets of copies are kept in alignment by the fan-like fold.

It will be apparent from the foregoing description that the copies which are created by folding the paper across can be of various widths to suit the specific purposes for which they are intended.

The carbons are laid between the fold alternatively from right to left sides of the continuous form feed device.

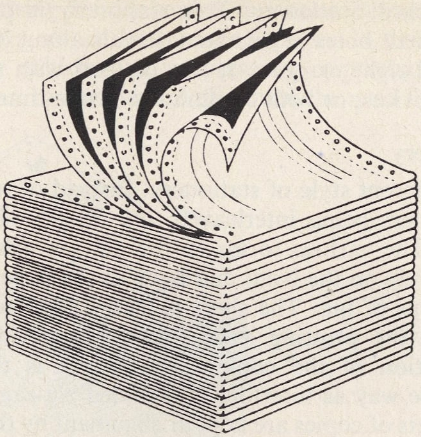
Fanfold forms can be obtained interleaved fully with one-time carbon, held together along a margin which is perforated.



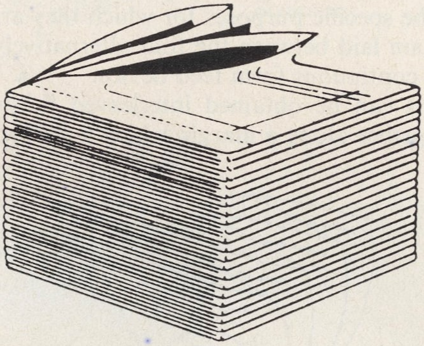
Fanfold Stationery.

Ordering Considerations

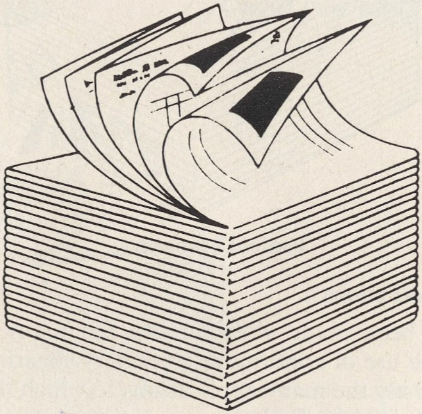
Reference has been made elsewhere to the many machines that operate with the use of continuous stationery. Bearing this in mind, together with firstly the many applications to which they may be put, and secondly, the types of continuous stationery available, it will no



Sprocket Punched Fanfold Stationery with One-time Carbon.



Fanfold Stationery Carbon Interleaved with Marginal Tie.



Fanfold Stationery Carbon Backed.

doubt be realised that the field is extremely wide and complex. Design and manufacture is dependent upon all these factors and there are consequently many features that cannot be specified in detail.

Where this type of stationery is already in use, several complete sets should be sent to the supplier for enquiry or ordering purposes. This is particularly important when a change of supplier, or application, is envisaged. If consideration is being given to a changeover to this form of stationery, then samples of existing forms, details of application and machines, should be sent to the supplier. Often manufacturers representatives are available for local consultation and advantage of their assistance should be taken.

It should be noted that continuous stationery requirements can broadly be divided into three basic groups according to the class of machine, *i.e.*, autographic registers, general office machines and, automatic data processing machines. The latter operate at much higher speeds and therefore require greater dimensional precision. Basic manufacturing and size considerations for each group are dealt with in separate sections.

Storage of Continuous Stationery

Continuous stationery should be kept under the following conditions:

(1) Under normal office conditions, *i.e.*, extremes of heat or humidity should be avoided.

(2) Off the floor, *i.e.*, not directly touching a floor. (This applies to containers.)

(3) In the original containers until required for use.

(4) Containers of continuous stationery should be stacked not more than three high.

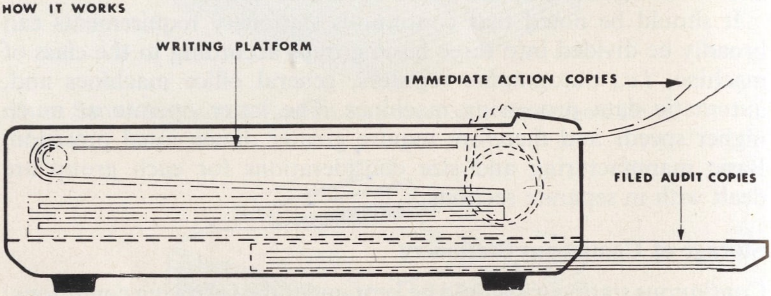
(5) Containers of continuous stationery incompletely filled should be kept separately and never stored within a stack although they may stand on top of a stack.

9. Continuous Stationery for Autographic Registers

Registers

Continuous stationery registers are extremely widely used, and most readers will have seen them on a shop counter, in a garage or on a trade counter. Although at one time they were regarded as speciality equipment, it is now true to say that registers are accepted as a simple item of business equipment suitable for many business applications. Development work by manufacturers, leading to smaller and cheaper registers which are simple to use, is accelerating this trend. Retailers are also benefiting from the fact that a register is not a "one off" sale. It is one of those useful items that generates its own repeat orders, for basically a register is a machine designed to consume continuous stationery, and the user must keep buying more stationery so long as he uses the register.

A register, then, is a device for holding continuous stationery forms in alignment and keeping the carbon in position so that entries can be made quickly and conveniently. Although there are variations in the registers offered by different manufacturers, the basic principles are as illustrated.



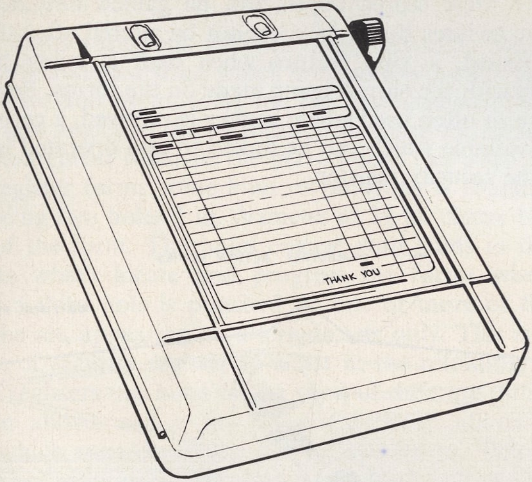
Principle of Continuous Stationery Register.

Once the register is loaded, a set of forms can be entered, moved forward and drawn out, this action automatically bringing the next set into position for a further entry to be made. As the new set moves into position in the writing aperture, the forms slide on either side of the carbon so that no repositioning of the carbon paper is required. Some form of temporary storage space is usually provided for retained copies.

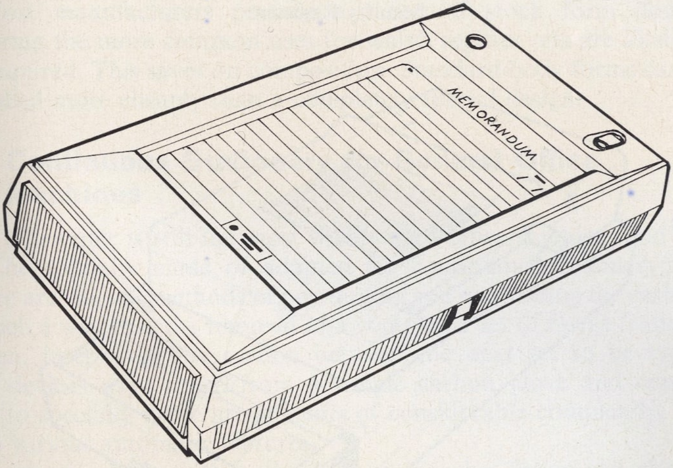
There are two basic types of register:—

(*i*) *Portable Registers*

These are small registers, light enough to be carried in the hand, and intended for use when there is no fixed point from which they are to be operated. Because of the comparative cheapness of the portable register, they are often used simply to save initial expense rather than for mobility. The traditional material used for making portable registers has been steel, but manufacturers are now developing cheaper and simpler versions of the portable register: in some cases they are turning to plastic materials to help achieve this. Page 789 shows the traditional type of metal register and the newer plastic version. Portable registers will usually produce an original and three copies.



Traditional Metal Register.

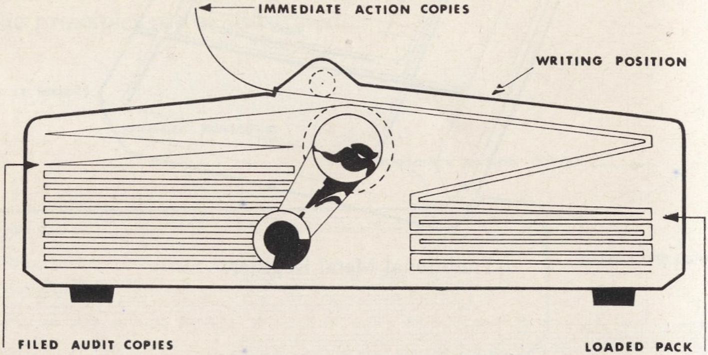


Plastic Register.

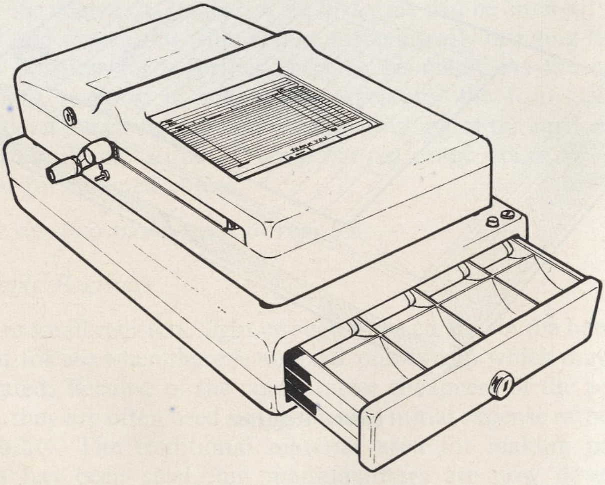
(*ii*) *Security Registers*

The name itself describes the extra feature provided on this type of register. A compartment is provided in which copies not immediately required are automatically refolded. Page 790 shows this in diagram form.

Access to these stored copies can be gained only with a key. This feature ensures that copies cannot be altered after the original has been issued, a vital feature when cash is being handled in conjunction with the entries being made on the forms. Because these registers are so often used where money is received, a cash drawer is normally available which can be linked to and operated in conjunction with the security register.


IMMEDIATE ACTION COPIES
WRITING POSITION
FILED AUDIT COPIES
LOADED PACK

Security Register.



Security Register with Cash Drawer.

Security registers normally will produce an original and five copies.

Register Forms

There are slight variations between manufacturers, but there are three basically accepted sizes, which are approximately 6 in. × 4 in., 8½ in. × 5½ in. and 8½ in. × 8½ in. The first measurement given is always at right angles to the perforation dividing the forms, and the second measurement is across the perforations (see page 792).

On all register forms some kind of punching is found, the most common being two holes ⅜ in. diameter at 2¾ in. centre to centre in the head of the form. The holes engage with studs in the register mechanisms which locate and progress the forms when in use. Sometimes a third hole is punched on one or more of the bottom copies of the set, appearing on alternate sets only. This is needed in some types of security register to assist in the refolding. A limited number of registers use holes at the head of differing dimensions to those given above, and a few use an entirely different form of punching which runs down the side of the forms. This is usually referred to as "marginal or sprocket punching," and the registers as "pin-wheel registers."

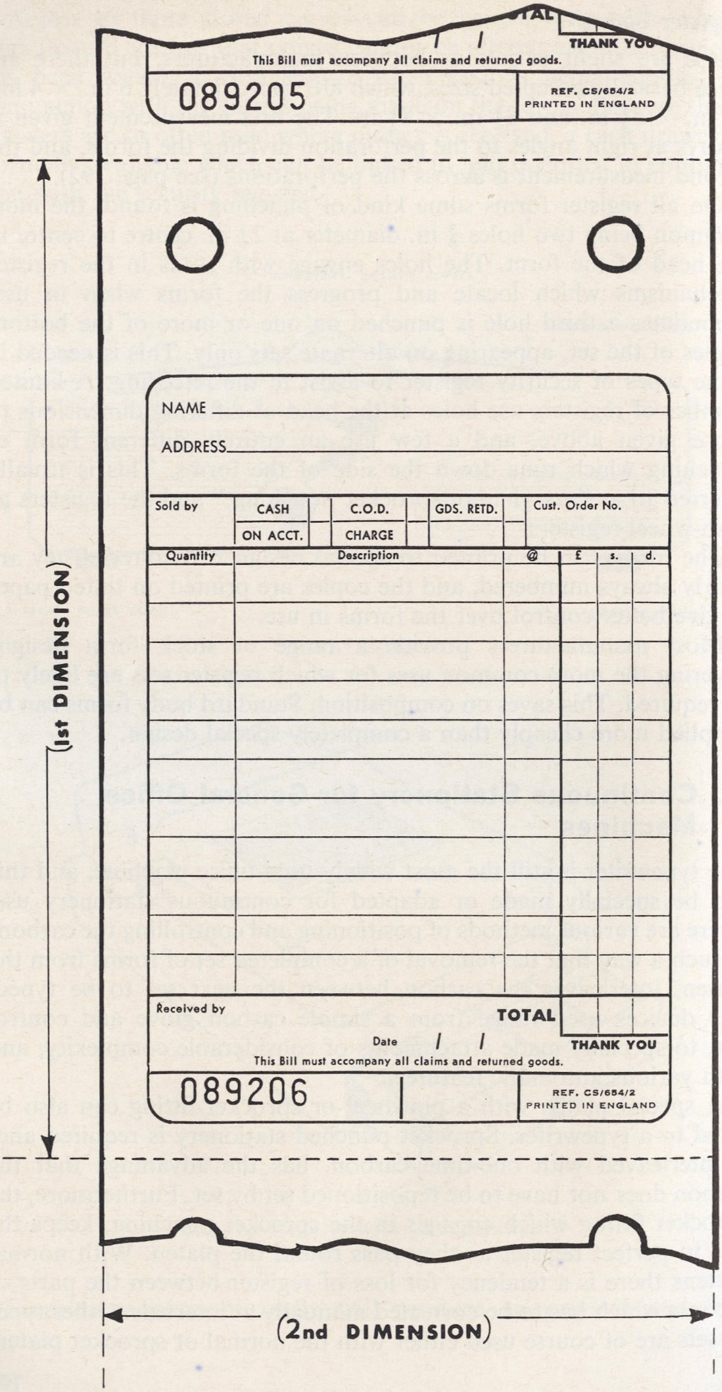
The forms can be printed to special design if required. They are nearly always numbered, and the copies are printed on tinted paper to give better control over the forms in use.

Most manufacturers provide a range of stock form designs covering the more common uses for which register sets are likely to be required. This saves on composition. Standard body forms can be supplied more cheaply than a completely special design.

10. Continuous Stationery for General Office Machines

The typewriter is still the most widely used office machine, and this can be specially made or adapted for continuous stationery use. There are various methods of positioning and controlling the carbons in such a way that the removal of a completed set of forms from the platen, interleaves the carbon between the next set to be typed. The devices used range from a simple carbon glove and control bar, to specially made attachments of considerable complexity, and with various automatic features.

A special platen with a pinwheel or sprocket fitting can also be fitted to a typewriter. Sprocket punched stationery is required and, if interleaved with one-time carbon, has the advantage that the carbon does not have to be repositioned set by set. Furthermore, the sprocket fitting which engages in the sprocket punching, keeps the sets in perfect register as they pass round the platen. With normal platens there is a tendency for loss of register between the parts of the sets which has to be corrected manually at intervals. Other types of sets are of course used either with the normal or sprocket platen.



TAL

/ /

THANK YOU

This Bill must accompany all claims and returned goods.

089205

REF. CS/654/2
PRINTED IN ENGLAND

NAME

ADDRESS

Sold by	CASH	C.O.D.	GDS. RETD.	Cust. Order No.
	ON ACCT.	CHARGE		

Quantity	Description	@	£	s.	d.

Received by

TOTAL

Date / /

THANK YOU

This Bill must accompany all claims and returned goods.

089206

REF. CS/654/2
PRINTED IN ENGLAND

A Typical Register Form.

Accounting machines are now used for applications other than ledger posting. This has resulted in the use of continuous stationery with these machines.

Sizes

Depth: The form depth is the dimension of one form measured at right angles to the form width. As continuous stationery is produced on rotary presses, the circumference of the print cylinder governs the depth of forms. The most widely used range of standard depths are:—

Inches	3	4	5	5½	6	8	8½	10	11	12	13
Mm.	76	102	127	140	152	203	216	254	279	305	330

Other depths are available dependent upon manufacturers machinery. Although no variation is possible in standard depths available, some presses are in use which can print forms in depth increments of ½ in. (12·7 mm.). In the interests of economy, however, standard depths are recommended at all times.

Width: The overall width of a form is measured at right angles to the length of continuous stationery, including margins necessary for feeding or multi-part specification. The preferred overall widths of forms with margins are:—

Inches	..	4	5½	8½	11
Mm.	..	102	140	216	279

If other and intermediate widths are required they should be in increments of ½ in.

International Sizes: Due to limitations of some machines it is not always practicable to produce sizes to the exact international sizes. However, the variable size machines available make it possible to produce very close to A size measurements, providing the stationery is not sprocket punched.

Sprocket Punching

Where sprocket holes are required the following measurements should be adhered to:—

Vertical Spacing: Sprocket holes should be ½ in. (12·7 mm.) from centre to centre which is an internationally accepted standard. The forms on continuous stationery should, if possible, be so designed that all horizontal perforations fall equidistant between the sprocket holes.

Horizontal Spacing: The centre of the sprocket holes should be ¼ in. (6·3 mm.) from the vertical edge.

Diameter: The diameter of the holes is usually $\frac{5}{32}$ in. (4 mm.). However, where carbon paper is used and also punched, a larger diameter hole, $\frac{7}{32}$ in. (6 mm.) is sometimes used.

Centre Line: The line through the centre of the holes, across the form, should be square with the line through the centre of the holes vertically.

Perforations and Fixing

Perforation of the stationery can be vertical and/or horizontal and most requirements can usually be accommodated. Multi-part sets require a method of fixing the parts together. This is usually effected by crimping, line or spot glueing, thread stitching and wire stapling.

11. Continuous Stationery for Automatic Data Processing Machines

Stationery requirements for this group of machines is particularly exacting and more specialised than for general office machines. Specifications vary so much from machine to machine that it is only possible to generalise and emphasise that there must be extremely close liaison between user, supplier and manufacturer, to obtain the correct stationery requirement. Punched card equipment, computers, printers, etc., operate at very high speeds. This necessitates precision in paper specification, print registration, and general manufacture. Precision in operating is achieved by the use of special form feeding devices and the use of sprocket punching.

Sizes

Depth: Since all machines rely on sprocket mechanisms for feeding the stationery it will be apparent that the depth of form should be in multiples of ½ in. (12·7 mm.) to correspond to the pitch of sprocket punching. There are no fixed depths for this stationery, the size being governed by the function, design and subsequent filing of the document. The sizes range between 3 in. (76 mm.) and 13 in. (330 mm.) in increments of ½ in. although in certain circumstances it is possible to obtain forms 16 in. or 22 in. deep. There are, of course, always exceptions to the rule and although it is generally accepted that the stationery is manufactured in ½ in. increments it is possible to obtain forms 3⅓ in. deep provided they are printed and folded three to view to give a 10 in. deep document with two intermediate perforations; another example would be a 4¼ in. form produced two to view at 8½ in. In both cases the full depth of document is a multiple of ½ in. This treatment is essential where machines do not handle documents less than 7½ in. in depth, due to difficulty in feeding, *i.e.*, in such cases as the production of wage slips 1 in. or 1½ in. in depth.

Generally speaking this type of stationery is produced on fixed size rotary presses with cylinders of the following circumferences:

Inches ..	15	17	20	22	24	26
Mm. ..	379	432	508	559	610	660

In circumstances where only short runs are required, up to say 25,000, variable size presses are used which are much more versatile than the rotary machines.

Width: With regard to widths of stationery, the minimum form certain machines can take is $3\frac{1}{2}$ in. and the maximum 22 in., but the wider the form the more difficult it is to feed. If a narrow form is required it may be possible to print 2 on side by side, this has great advantages in large scale operations such as rendering telephone accounts or gas bills, as it reduces the print out time by half.

For general purpose analysis, accounting and control, stock listing papers are available in standard sizes at very much lower prices than specially printed forms. These can be obtained in single part or multi part up to six ply, with or without carbon interleaves, carbon backed or special coated papers in the following sizes:—

Inches	$10\frac{3}{8}$	$12\frac{27}{32}$	$14\frac{1}{2}$	$15\frac{5}{16}$	$17\frac{25}{32}$	×11 in. deep
Mm.	264	326	368	389	452	×279·5 deep

Sprocket Punching

Punching is to the same specification as that used for general office machine stationery.

Perforation and Fixing

The amount of perforation is dependent upon the speed of the machine. Generally, for high speed operation 30 per cent. of the paper is retained and there are 6 to 7 cuts to the inch. It is also advisable that the perforation stops short at each edge by a minimum of one-eighth to reduce the possibility of tearing.

As is usual with multi-part sets, it is advisable to have some means of holding the various parts and carbons together. This is to hold registration through the set and prevent faulty feeding through the printer with consequent loss of output and possible damage. Certain manufacturers have their own patented methods of fastening which are extremely efficient but the two most commonly used methods are crimping and spot or line gumming. Wire stapling is not recommended.

Separation of Forms

When continuous stationery forms have been completed, volume of output would be nullified without equipment to separate the forms at similar high speed. Such equipment is dealt with in a subsequent chapter.

12. Recommended Layouts of Commercial Forms

A British Standard has been prepared under the authority of the Office Equipment and Supplies Standards Committee, and supersedes the previous edition of the standard published in 1951.

This edition of the standard differs from that published in 1951 in several respects. Thus, the recommended layouts of forms have been revised and take into account developments in mechanical processing of information on forms. In line with the greater mechanization of offices, and more efficient office practice, the new layouts have been designed to facilitate the enclosure of the various forms in window or aperture envelopes. At the same time, facility to use other envelopes is not diminished.

In the light of the above considerations, it has been agreed to go on to consider the preparations of further parts of this standard which will deal with continuous stationery.

The number of sizes specified for each individual form has also been reduced since the need for the wide variety of sizes previously specified has not been justified. Two of the sizes specified, A4 and A5, are taken from the "A" series of paper sizes. This is to meet the growing interest in, and demand for, this series which has taken place in this country over the last few years.

No attempt has been made to standardize precise layouts, since requirements vary according to the needs of individual users, and it is realised that there will be exceptional cases in which some departure must be made from the layouts recommended. When the provisions for the presentation of information are found in a fixed position, however, the work of entering, reading, and processing information is made easier.

It will be noted that the addressee's field appears on the right of the forms. This has been done at the request of the British Post Office, who point out that the *Post Office Guide* strongly recommends that the address should invariably appear on the right of the envelope; consequently it is necessary for the address to be on the right of any form intended for dispatch in a window envelope. The international discussions on this subject have revealed that this recommendation is common to all postal administrations. On the other hand, the majority of countries represented at the relevant meeting of the International Organization for Standardization urged that addresses on the left should also be permitted and the Universal Postal Union representatives agreed to investigate this matter further; this may, however, take some considerable time.

In consequence, while this British Standard recommends the procedure at present favoured by postal administrations, users of this standard should recognize that it may need to be amended if the postal administrations should decide to modify their views on this subject.

This standard deals with the main forms in use between businesses. It is considered, however, that many of the principles laid down may be of assistance to those responsible for the design of internal forms.

Forms of standard sizes can be most easily handled and filed, and those here specified can be cut economically from sheets of the appropriate stock sizes.

Scope

This British Standard covers the following types of commerical forms, *except when they are produced on reel-fed machines:*

Letterhead, which here includes those used for inquiries and quotations.
Purchase order.
Packing note, advice of dispatch, and invoice set.
Invoice (when prepared separately).
Statement of account.

Remittance advices have not been dealt with since their employment in commerce is by no means universal.

Stationery produced in the form of books, *e.g.*, counter check books, is not dealt with.

Definitions

For the purpose of this British Standard the following definitions apply:

Order form. The form containing either an invitation from a potential buyer to a seller to enter into a contract for the supply of goods, or services, or an acceptance of a previous offer.

Invoice. A detailed memorandum from a supplier to a purchaser showing the charges due for goods or services specified.

Packing note. A note accompanying a consignment of goods and showing their quantity and description.

Advice note. A notification sent by a supplier to a consignee:

(*a*) Advising that certain specified goods have been dispatched, or
(*b*) Advising that certain specified services have been provided on the date and in a manner stated.

Statement of account. A summary sent to a customer giving the date and amount of each invoice or other item debited, each credit note or other item credited, and each payment, and showing the balances owing at the beginning and the end of the period.

Sizes

For the purposes of this British Standard, the dimensions of commercial stationery of the traditional British sizes are quoted in accordance with the normal British practice, *i.e.*, with the vertical measurement first. The dimensions of the international sizes are quoted in accordance with international practice, *i.e.*, with the smaller dimension first. *The sizes given in this Part of the standard do not necessarily apply to continuous stationery.*

The sizes used for commercial stationery shall be any of the following which are shown on the illustration of the particular kind of stationery on pages 800–806.

Vertical		**Horizontal**	
in.		in.	mm.
10	×	8	(254 × 203)
8	×	5	(203 × 127)

Horizontal		**Vertical**	
mm.		mm.	in.
210	×	297	(8¼ × 11¾)
148	×	210	(5⅞ × 8¼)

Note. It is normal international practice always to give the smaller dimension first, and to indicate landscape shape by an additional symbol. An international agreement on the symbols for this purpose is being prepared. Meanwhile, in case of doubt it is desirable to verify whether portrait or landscape shape is meant.

Design

For the purpose of this standard each form has been divided into a number of "fields" which are the areas of the document provided for inserting information. In the diagrams the fields are indicated by horizontal or vertical lines. These are introduced for clarity and it is not intended that they should necessarily be printed on the forms themselves. Except where specifically stated, dimensions of fields are dependent on the circumstances of each case, *e.g.*, on the amount of information to be entered, and on the method of entry, *i.e.*, by handwriting, typewriter or other machine, etc. A serial number when printed should, wherever possible, be placed in the top right hand corner for ready reference.

(*a*) *Heading.* On all forms except letterheads, the title of the document should be clearly shown at the head. The telephone numbers and telegraphic address should be so positioned that they will not be obscured when papers are clipped together or filed.

(*b*) *Filing margin.* There should be a filing margin at least 1 in. (25·4 mm.) wide running the full length of the form at the left edge to facilitate filing without obscuring details to which reference might be necessary. This margin may be used for printing the conditions of purchase or other similar matter.

(*c*) *Address field.* The layouts show limit marks for fields for names and addresses. These fields are related to the position of windows or apertures in envelopes.

(*d*) *References.* The references which can be presented are too numerous to allow all of them to be shown in the layouts. When they are spread across the width of the form, it is recommended that the more common should be in the following sequence:

Customer's reference: Supplier's reference: Date.

(*e*) *Instructions.* In this field provision should be made only for variable information applicable to the particular transaction, *e.g.*, delivery date, and method of transit.

(*f*) *Foot of the form.* It is normally difficult to type near the bottom edge of a piece of paper; general instructions and information which can be printed have therefore been located here. If they are lengthy, it may be more convenient to print a note at the foot of the form that instructions and information are printed on the back.

(*g*) *Distances between horizontal rulings.* To facilitate the typing of these forms, it is recommended that the distances between the centres of the rulings should be in multiples of $\frac{1}{6}$ in. (4·2 mm. approx.).

Postal Regulations

Attention is drawn to Post Office regulations for envelopes and printed papers which are detailed in the *Post Office Guide*, many of which have been detailed in the chapter covering Envelopes. These regulations affect the layout, make-up, type of printing, and permissible additions where forms are intended to be sent in window envelopes.

Layout

It is recommended that the layout of the commercial forms covered in this standard should conform to pages 800–806.

Notes on the Layout of Forms

(*a*) If the entry in the consignee's field is the same as that in the addressee's field, the name and address should be entered in the latter field only (see Design item C).

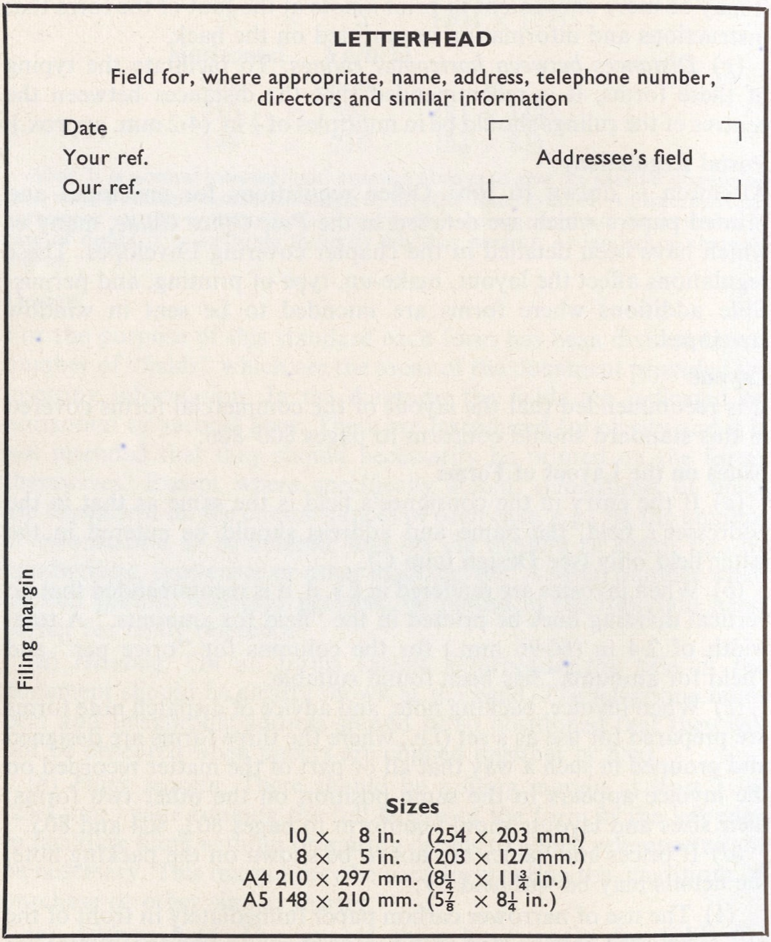
(*b*) When invoices are rendered in £ s. d. it is recommended that no vertical dividing lines be printed in the "field for amounts." A total width of 2·4 in (60·96 mm.) for the columns for "price per" and "field for amounts" has been found suitable.

(*c*) When invoice, packing note, and advice of dispatch note forms are prepared for use as a set (*i.e.*, where the three forms are designed and grouped in such a way that all or part of the matter recorded on the invoice appears in the same position on the other two forms) their sizes and layouts should conform to pages 803, 804 and 805.

(*d*) If prices and values are not to be shown on the packing note, the details may be withheld by:

(1) The use of narrower carbon paper immediately in front of the packing note so that cash details appearing on the invoice are not copied;

or (2) Reducing the width of the packing note by the width of the cash columns on the invoice. The width of the narrower carbon or form will determine the maximum widths of fields above the fields for description of goods, and quantity, into which information is to be entered simultaneously. It may also determine the position of an envelope aperture.



LETTERHEAD

Field for, where appropriate, name, address, telephone number, directors and similar information

Date
Your ref.
Our ref.

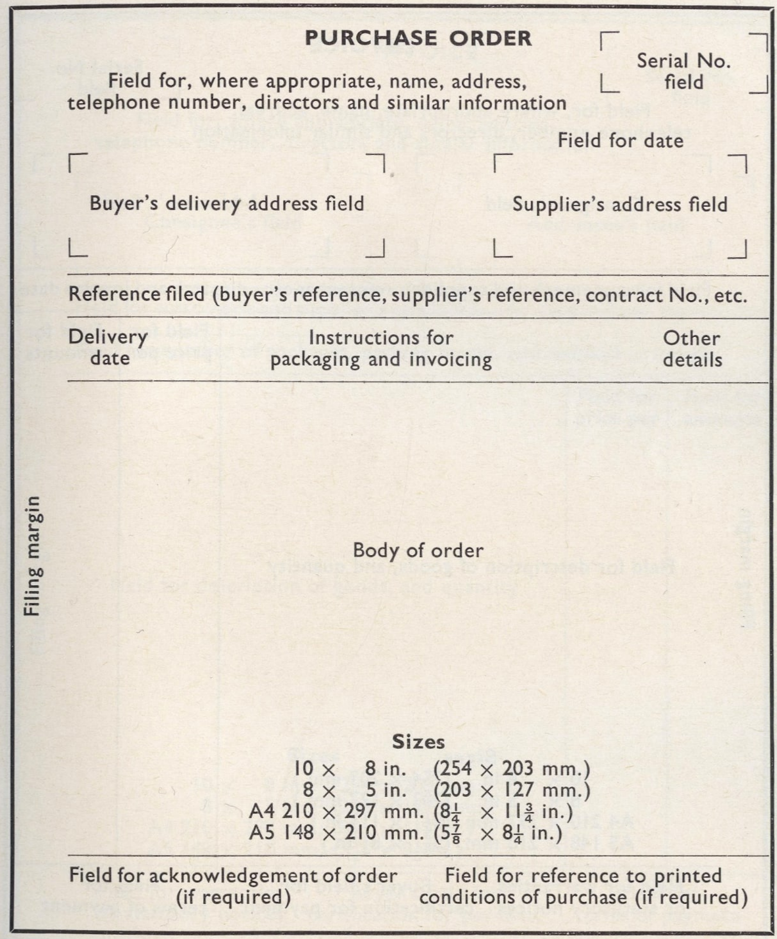
Addressee's field

Filing margin

Sizes

10 × 8 in. (254 × 203 mm.)
8 × 5 in. (203 × 127 mm.)
A4 210 × 297 mm. ($8\frac{1}{4}$ × $11\frac{3}{4}$ in.)
A5 148 × 210 mm. ($5\frac{7}{8}$ × $8\frac{1}{4}$ in.)

Layout of Letterhead.



PURCHASE ORDER

Serial No. field

Field for, where appropriate, name, address, telephone number, directors and similar information

Field for date

Buyer's delivery address field

Supplier's address field

Reference filed (buyer's reference, supplier's reference, contract No., etc.

Delivery date	Instructions for packaging and invoicing	Other details

Filing margin

Body of order

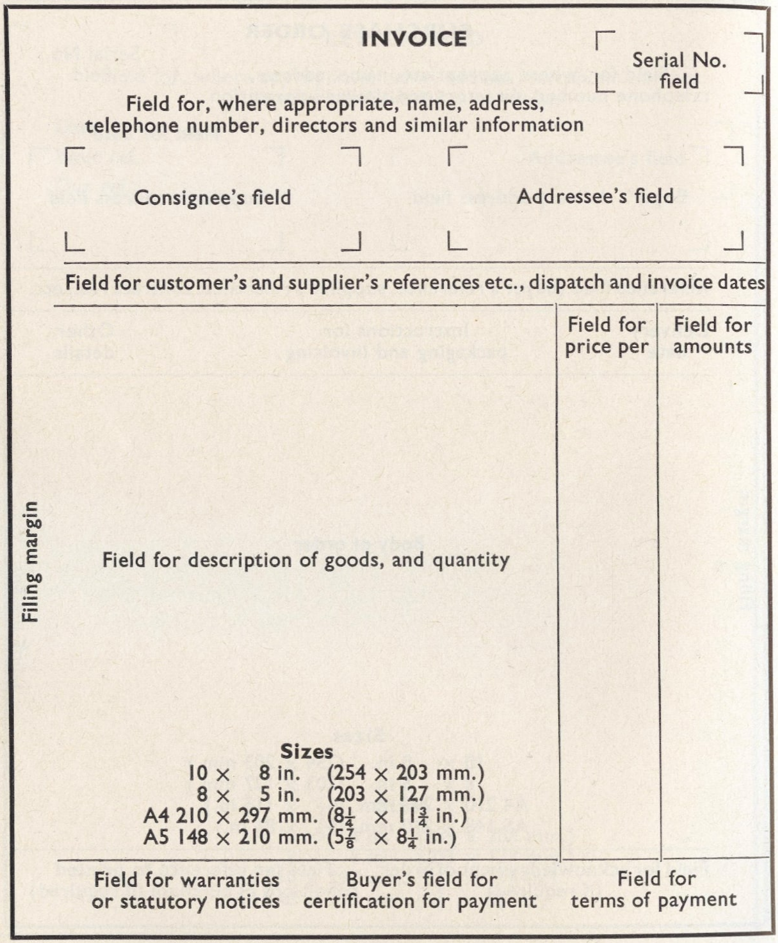
Sizes

10 × 8 in. (254 × 203 mm.)
8 × 5 in. (203 × 127 mm.)
A4 210 × 297 mm. (8¼ × 11¾ in.)
A5 148 × 210 mm. (5⅞ × 8¼ in.)

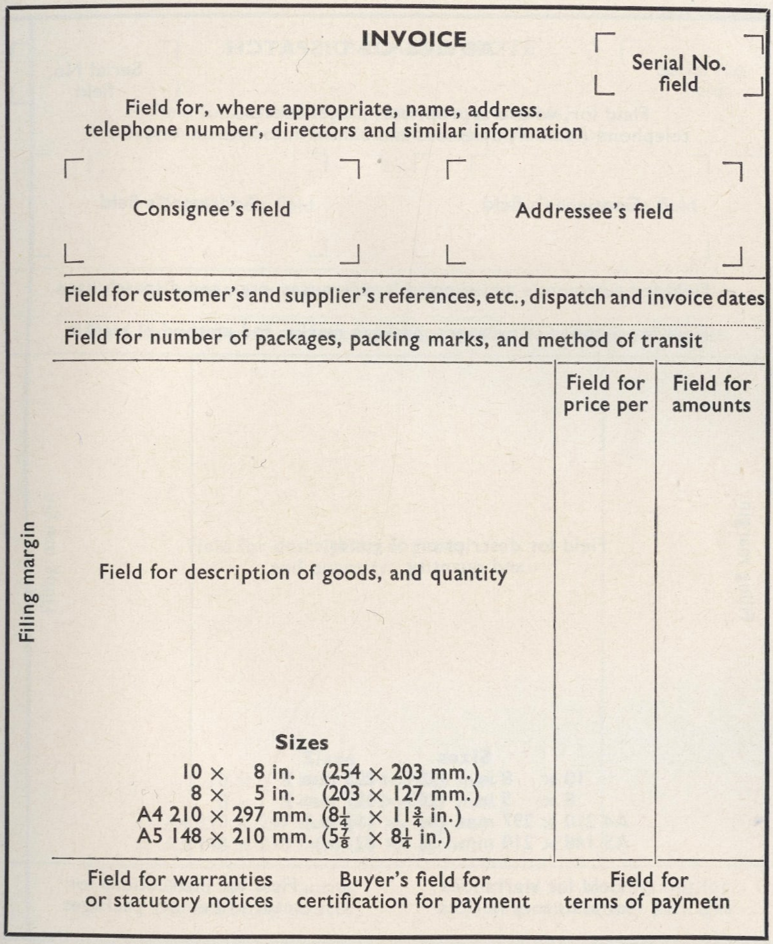
Field for acknowledgement of order (if required)

Field for reference to printed conditions of purchase (if required)

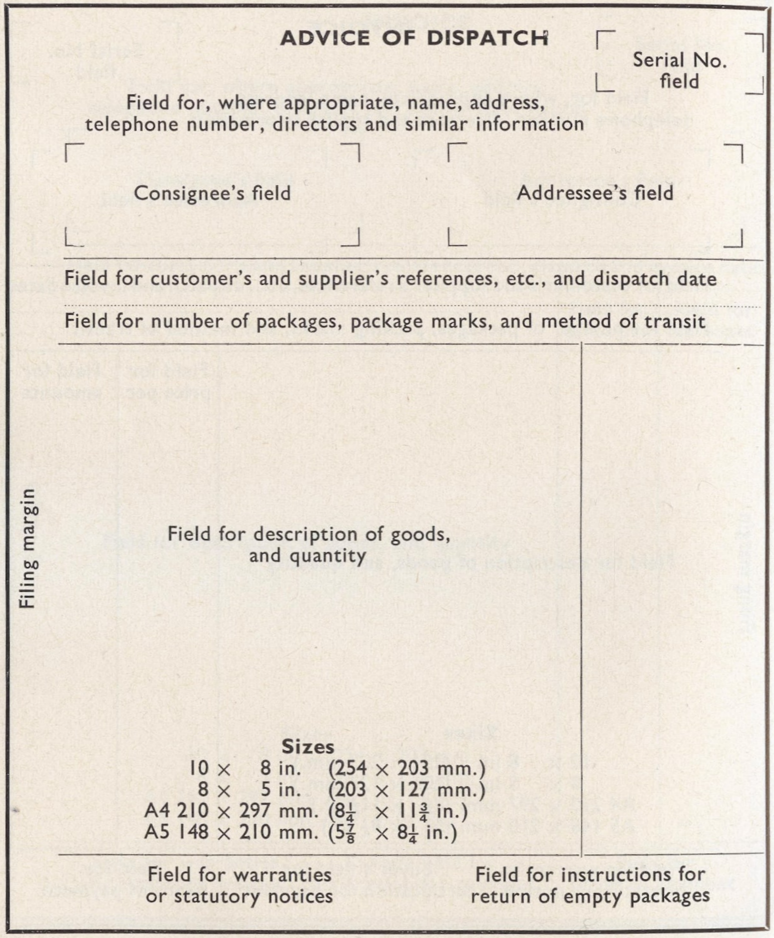
Layout of Purchase Order.


INVOICE
Serial No. field
Field for, where appropriate, name, address, telephone number, directors and similar information
Consignee's field
Addressee's field
Field for customer's and supplier's references etc., dispatch and invoice dates
Field for price per
Field for amounts
Filing margin
Field for description of goods, and quantity
Sizes
10 × 8 in. (254 × 203 mm.)
8 × 5 in. (203 × 127 mm.)
A4 210 × 297 mm. (8¼ × 11¾ in.)
A5 148 × 210 mm. (5⅞ × 8¼ in.)
Field for warranties or statutory notices
Buyer's field for certification for payment
Field for terms of payment

Layout of Single Invoice.


INVOICE
Serial No. field
Field for, where appropriate, name, address. telephone number, directors and similar information
Consignee's field
Addressee's field
Field for customer's and supplier's references, etc., dispatch and invoice dates
Field for number of packages, packing marks, and method of transit
Field for price per
Field for amounts
Filing margin
Field for description of goods, and quantity
Sizes
10 × 8 in. (254 × 203 mm.)
8 × 5 in. (203 × 127 mm.)
A4 210 × 297 mm. (8¼ × 11¾ in.)
A5 148 × 210 mm. (5⅞ × 8¼ in.)
Field for warranties or statutory notices
Buyer's field for certification for payment
Field for terms of paymetn

Layout of Invoice (of a combined set).



ADVICE OF DISPATCH

Serial No. field

Field for, where appropriate, name, address, telephone number, directors and similar information

Consignee's field

Addressee's field

Field for customer's and supplier's references, etc., and dispatch date

Field for number of packages, package marks, and method of transit

Filing margin

Field for description of goods, and quantity

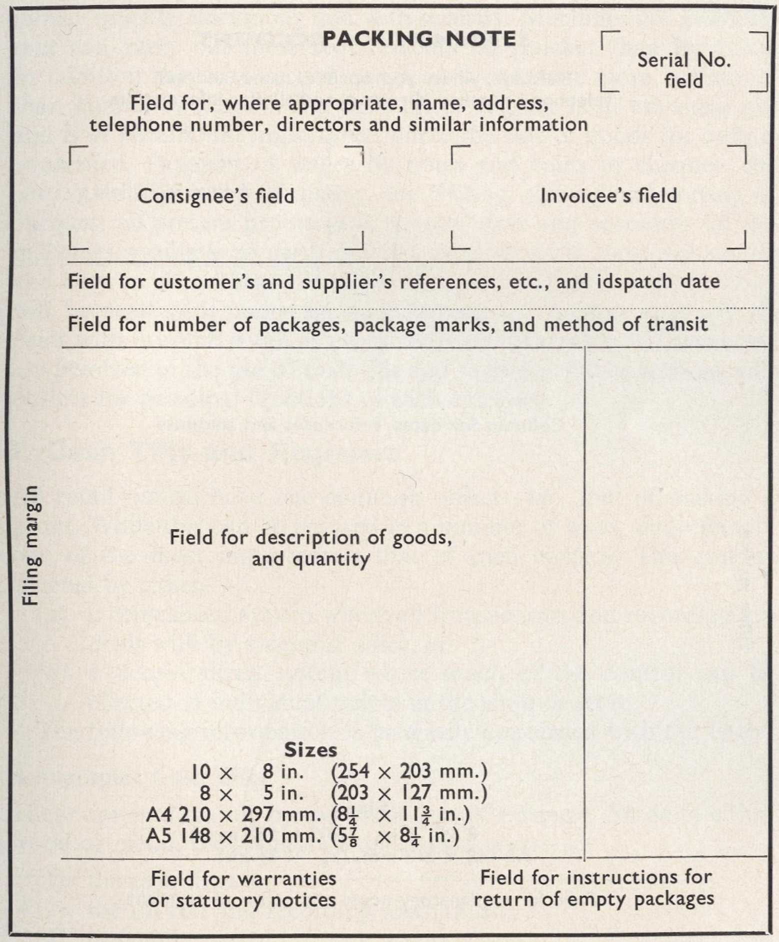
Sizes

10 × 8 in. (254 × 203 mm.)
8 × 5 in. (203 × 127 mm.)
A4 210 × 297 mm. ($8\frac{1}{4}$ × $11\frac{3}{4}$ in.)
A5 148 × 210 mm. ($5\frac{7}{8}$ × $8\frac{1}{4}$ in.)

Field for warranties or statutory notices

Field for instructions for return of empty packages

Layout of Advice of Dispatch Note.



PACKING NOTE

Serial No. field

Field for, where appropriate, name, address, telephone number, directors and similar information

Consignee's field

Invoicee's field

Field for customer's and supplier's references, etc., and idspatch date

Field for number of packages, package marks, and method of transit

Filing margin

Field for description of goods, and quantity

Sizes

10 × 8 in. (254 × 203 mm.)
8 × 5 in. (203 × 127 mm.)
A4 210 × 297 mm. ($8\frac{1}{4}$ × $11\frac{3}{4}$ in.)
A5 148 × 210 mm. ($5\frac{7}{8}$ × $8\frac{1}{4}$ in.)

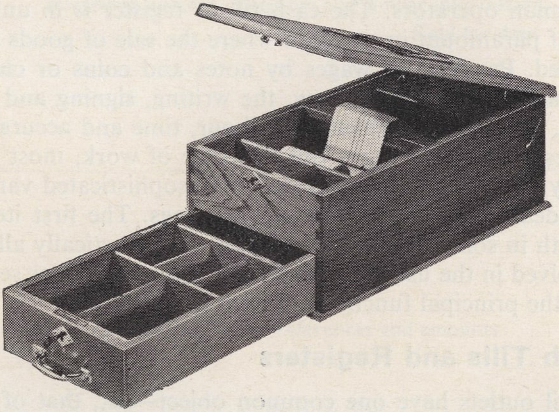
Field for warranties or statutory notices

Field for instructions for return of empty packages

Layout of Packing Note.

columns. If the quantity of rolls is large enough they can also be ruled and/or printed to special requirements.

While such tills offer a semblance of security and, by means of the record roll, enable certain information to be detailed, they are obviously not the complete answer to cash control. Mistakes in hand-written notations can occur and there is the possibility of incorrect totalling. In addition, the time taken to balance and analyse makes the procedure a slow one.



Autographic Cash Till.

Autographic Sales Registers

This method has to some extent superseded the above and also that of pads of bills interleaved with carbon paper. Here the written record is of the continuous interfold type with two, three or four forms to a set. Such stationery can be of a stock design or specially printed, and details will be found in the appropriate section dealing with continuous stationery. The method is mentioned here because, apart from being used purely for written records, the register can be fitted to a cash drawer. Balancing at the end of the day is effected by the totalling of the copy retained in the register. Other copies of the set may be used as the receipt, order, delivery docket, or for analysis purposes.

Cash Registers

This type of machine, invented in 1879, has undergone continual and intensive development since that time, yet its possibilities as a means of controlling and recording sales and business transactions in every kind of retail business are still to be fully exploited.

There is one very important point concerning this machine. It should not be thought of as merely a receptacle for cash, but as a highly ingenious and sometimes complex piece of equipment which can automatically add or subtract, print business records, analyse cash and credit business according to departments, and keep an automatic count of customers and sales. Nowadays, it can also punch out paper tape as a by-product of its operation or even print sales information in specially stylized characters for automatic reading and processing by an electronic computer.

For the shopkeeper, however, whether his business is very small or very large, the cash register can offer four important basic advantages:

(1) **protection** of cash records,
(2) **information** on daily sales, amount of credit outstanding, etc.,
(3) **economy** of operation, thus reducing the amount of book-keeping necessary for the running of his business, and
(4) **speed** in handling business transactions.

Electrically operated Press-In Multi-Total Key Register with Docket Certification Feature.

CASH
2-19-11 ½

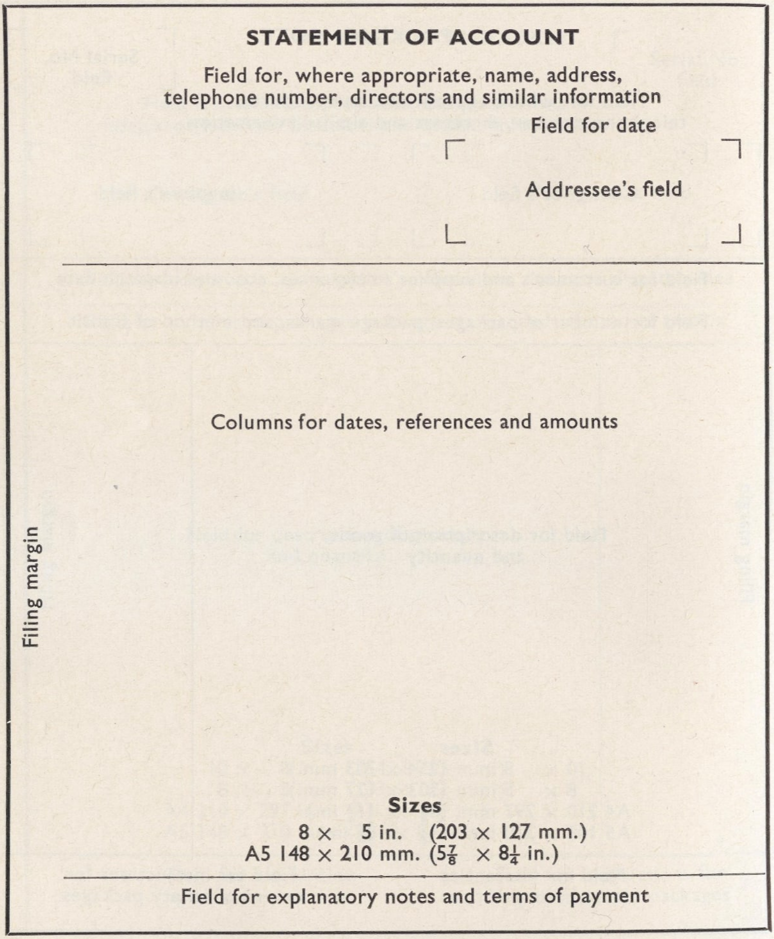
Manually operated Press-Down Key Register.

Types

There are three types of cash register in use today:

(1) the manually-operated ("press-down" key) model,
(2) the electrically-operated ("press-in" key) model and
(3) the lever-operated model.

Types (1) and (2) are the most widely used.


STATEMENT OF ACCOUNT
Field for, where appropriate, name, address, telephone number, directors and similar information
Field for date
Addressee's field
Columns for dates, references and amounts
Filing margin
Sizes
8 × 5 in. (203 × 127 mm.)
A5 148 × 210 mm. (5⅞ × 8¼ in.)
Field for explanatory notes and terms of payment

Layout of Statement of Account.

CHAPTER 22

Coin and Note Handling Equipment

Shops, supermarkets, vending machine operators, cinemas, commercial and industrial concerns, etc. need to handle large sums of money quickly, accurately and with security. Machines are available that can carry out these requirements far quicker than by hand. In addition they can record, total, sort or count more accurately than human operators. The cash till or register is in universal use and is of paramount importance where the sale of goods for cash is concerned. Payment of wages by notes and coins or cheques, the sorting and counting of money, the writing, signing and sorting of cheques, all present problems of labour, time and accuracy. Of the machines available to carry out this type of work, most are simple and easy to use; others are of the more sophisticated variety. They will be dealt with under six main headings. The first item will be dealt with in some detail as every shop and practically all assistants are involved in the use of cash tills and registers. Other sections will outline the principal functions of each category.

1. Cash Tills and Registers

All retail outlets have one common object—*i.e.*, that of making a profit. While this can be ensured in a number of ways, undoubtedly one of the most important is that of cash control. This can be effected by either—

(*a*) a centralized system where all transactions and recording are dealt with by a central office, or

(*b*) a decentralized system where much of the control can be effected at individual points in the shop or store.

The following information is primarily concerned with the latter.

Autographic Cash Tills

These are used mainly by the small type of business. Made of either wood or metal, they comprise three main parts:—

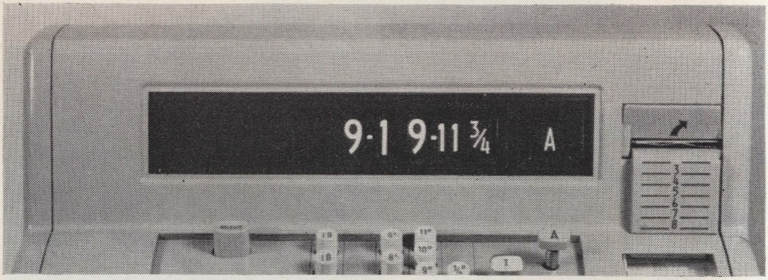
(1) the cash drawer;
(2) the till roll and recording mechanism;
(3) the outer case.

The amount of the sale is written on the till roll and the drawer is opened. This action also moves the till roll forward under a glass plate where the entry is visible but beyond alteration. The roll is added up at the end of the day and should, of course, correspond with the cash in the till, taking into account any refunds, petty cash payments, etc. The rolls are available in varying widths according to requirements and make of till, and are ruled with one or two cash

Generally speaking, there is one other major difference between types (1) and (2) apart from their power supply. On press-down key machines a total of items purchased has to be calculated before any registering can be done. On the electrically-operated machine, each individual item can be registered, the cash register adding them together automatically. Both, however, have common basic features and, briefly, their principal features are as follows.

Indication

"Two-way" natural indication is to be found on almost all cash registers produced today. This means that the amount displayed (which can be either an item or the total amount) is clearly visible on both sides of the counter in its natural reading sequence. The better the indication, the greater the protection, for it is a psychological deterrent to deliberate "under-ringing" and it is also a means of quick detection of a natural registering error.

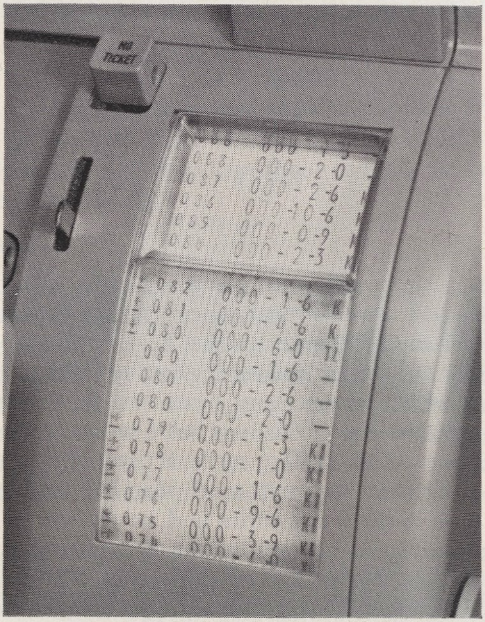


Indication.

Detail Audit Roll

This is a continuous paper roll which is locked into the cash register, on which every transaction—whether it is a cash or credit sale, an amount received on account or one paid out—is recorded in the order in which it occurs. Most audit rolls are of the autographic type—that is to say, they are visible under a small transparent cover which has an aperture in it. This allows additional information to be written by hand against the figures printed by the cash register—for example, customer's name and address, details of special sales, etc. On some machines the audit record is designed so that the last ten or more recorded amounts are visible, so as to allow easy spot-checking.

At the end of each day's business the audit roll can be removed and analysed. An audit roll can incorporate a valuable amount of business information—individual items purchased and their total value, assistant or department identification, the type of transaction and a transaction serial number. Secret checks on some machines indicate where incorrect registering procedure has been carried out—for instance, failure to overprint a document or to issue a ticket. Leading manufacturers construct their machines in such a way that the non-recording of assistant or department identification symbols is made impossible, thus strengthening the protection offered by the cash register.



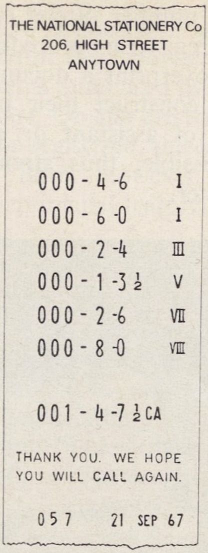
Audit Record.

Sales Ticket

This is a printed record of purchase for the customer, automatically printed and issued by the cash register each time a sale is registered. It carries the name and address of the business and can also incorporate a courtesy message to the customer such as "Thank you—please call again." The sales ticket, therefore, can be an advertising and goodwill medium as well as a check-list for the customer and a symbol of business efficiency. The sales ticket can also be employed usefully for credit sales, returns, etc. Tickets can be supplied in different colours and the courtesy or sales message printed on the ticket can be changed by means of slip-in electros.

Analysis Totals

Many businesses usefully employ single-total cash registers—in other words, the machine accumulates all sales during the day into



THE NATIONAL STATIONERY Co
206, HIGH STREET
ANYTOWN

000 - 4 - 6 I
000 - 6 - 0 I
000 - 2 - 4 III
000 - 1 - 3½ V
000 - 2 - 6 VII
000 - 8 - 0 VIII

001 - 4 - 7½ CA

THANK YOU. WE HOPE
YOU WILL CALL AGAIN.

057 21 SEP 67

Sales Ticket.

one cash total. There are, however, great advantages in the multi-total machine which incorporates from two to thirteen individual accumulating totals. For a business with several departments—for example, stationery and greeting cards, artists' materials, typewriters and office equipment—a multi-total machine will automatically accumulate sales in these categories and, at the end of the day, will print out the total value of sales in each department at the touch of the appropriate key. No manual analysis work after hours is needed, therefore, to distinguish the profitable department from the less profitable department.

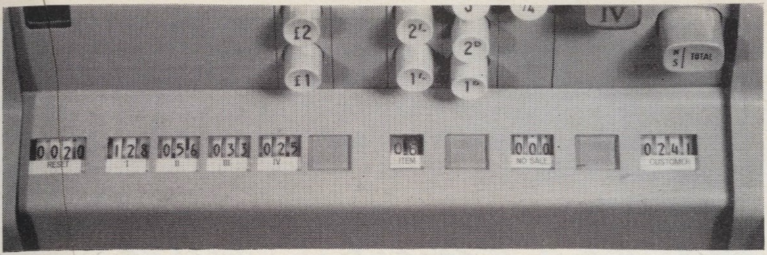
For a simpler form of sales analysis, or where sales-by-assistant analysis is required, certain models are equipped with print keys. These, when used, print an assistant identification against each sale on the audit roll.

Transaction Counters

These are automatic counters which record various kinds of business activity –number of customers, number of cash sales, credit sales, amounts received on account and "paid out" transactions. On multi-total machines each analysis total can have its counter so that, in addition to giving a total value of sales in each department, it can also record the number of customers served in each department.

Lever-Operated Registers

These provide for a lower-cost single and multi-total analysis system. Up to four individual analysis totals are available on this class of

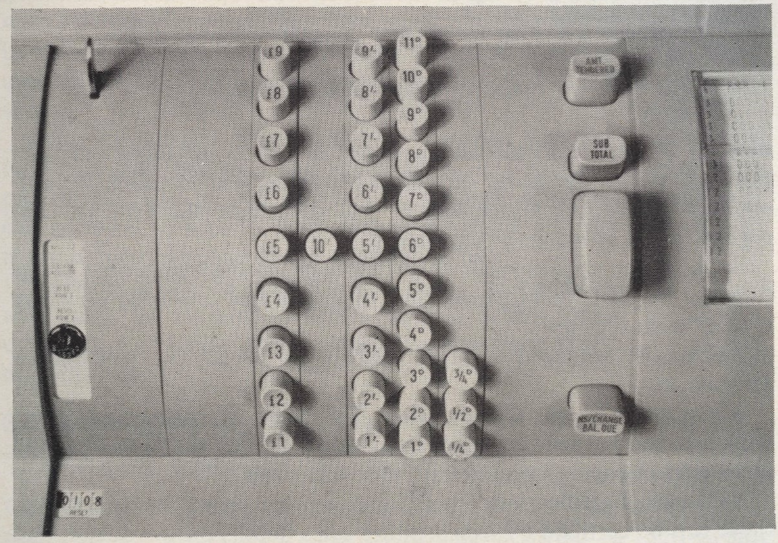

£2
£1
2/-
1/-
2d
1d
IV
TOTAL
RESET
ITEM
NO SALE
CUSTOMER

Transaction Counters.

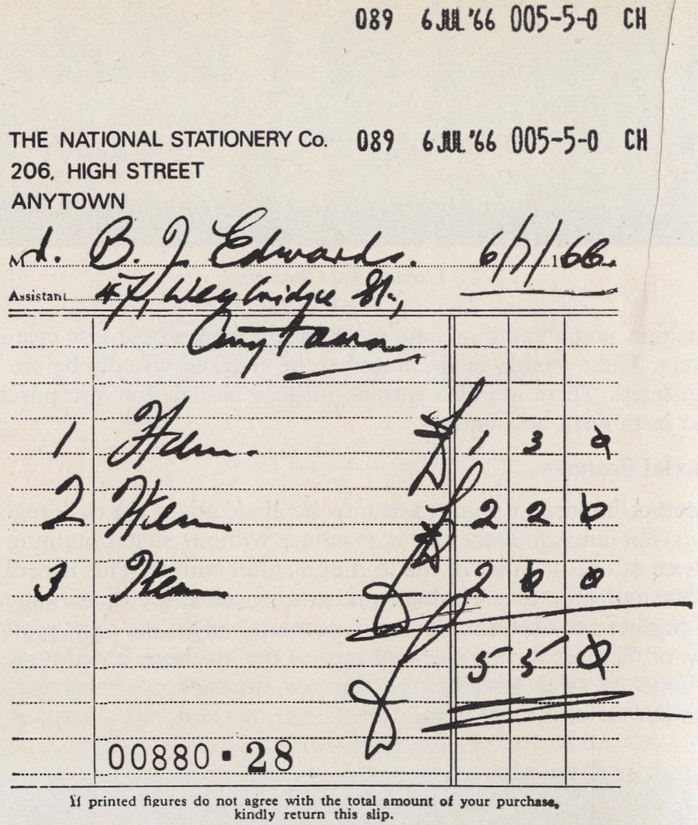
machine, and all amounts are recorded on the keyboard by means of levers. These enable each amount to be checked visually before it is registered. There are also special-purpose models for hire purchase and instalment accounting.

Special Features

Another important point must now be made about the cash register. It is not advisable to buy a machine without first obtaining the advice of one or other of the leading manufacturers. This is because, of the many features available on cash registers, not all are suited to all businesses. Therefore it is very necessary to get the right *combination* of features for the size and type of the business, based upon the volume of sales activity, the type of transactions occurring, the number of assistants employed at normal and peak periods, the


£9
£8
£7
£6
£5
£4
£3
£2
£1
10/-
9/-
8/-
7/-
6/-
5/-
4/-
3/-
2/-
1/-
11d
10d
9d
8d
7d
6d
5d
4d
3d
2d
1d
¾d
½d
¼d
AMT. TENDERED
SUB. TOTAL
MDSE/CHANGE BAL. DUE

Change Computation Register's Keyboard.



089 6JUL'66 005-5-0 CH

THE NATIONAL STATIONERY Co. 089 6JUL'66 005-5-0 CH
206, HIGH STREET
ANYTOWN

Mr. B. J. Edwards. 6/7/66
Assistant 47, Weybridge St.,
Anytown

1	Item.	1	3	9
2	Item	2	2	6
3	Item	2	6	0
		5	5	0

00880•28

If printed figures do not agree with the total amount of your purchase, kindly return this slip.

Automatic Certification Docket.

number of departments and the speed of service required (whether the business is operating on counter service, self-selection or self-service). These and other factors will determine the type of cash register most suited to any business.

Some of the special features available on modern machines are as follows, but it is emphasized that these are not available on every type of cash register.

Automatic Subtraction: This feature is useful for calculating refunds, etc.

Automatic Change Computation: The type of register equipped with this feature will compute the change due to the customer and issue coin change automatically, too, if desired.

Automatic Certification: Where hand-written sales dockets are used, these can be certified by overprinting sales details on the docket and copies. This ensures that the transaction has been correctly recorded and that the customer's record and the shop's record are identical, thereby guarding against inaccuracies or falsification.

Multi-Selector: This is an automatic "repeat" feature. Special keys (marked 2 to 11) on the keyboard enable the operator to record, say, five items at 1s. 3d. each by pressing the key marked 5 after setting up the amount. The machine will automatically add in the amount of 1s. 3d. five times.

Automatic Re-inking: This ensures uniformly clear printing of sales ticket and audit roll. A specially designed ink cartridge, which is easily replaceable, keeps the ribbon continuously well-inked.

Finally, it may be pointed out that there are different kinds of cash register for different kinds of trading: for example, for the self-service checkout it is necessary to have an itemizing machine. Cash registers have been specially designed for this very demanding type of operation.

Where individual assistant responsibility is desired, extra cash drawers can be fitted, usually up to four. Where a high percentage of credit business is transacted, then there is the right kind of cash register for this also.

In fact, when installing a cash register one is installing a system for profit protection and business control, and should ensure that this system is tailor-made to meet the particular requirements of the business.

2. Note Handling Machines

These machines will count items at speeds of up to 1,000 per minute, with 100 per cent. accuracy. Materials that can be handled include bank notes, cheques, postal orders, punched cards, invoices, labels and tickets, etc.—anything, in fact, from a small ticket to a foolscap sheet.

Automatic feeding and stacking ensures that the sequence of items passing through the machine is not altered. Counting is recorded on two meters; one records the individual batch count and can be re-set to zero by the touch of a button, and the other (which is tamper-proof) records the cumulative total.

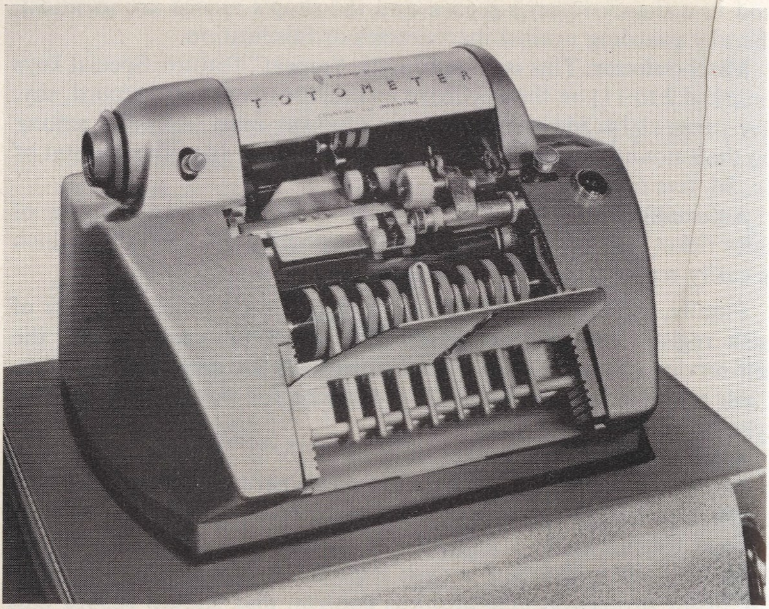
Imprinting can be performed in the same operation as counting and may be extremely varied in character. Dates, signatures, cancellations, codes and consecutive numbering are all standard applications.

3. Coin Handling Machines

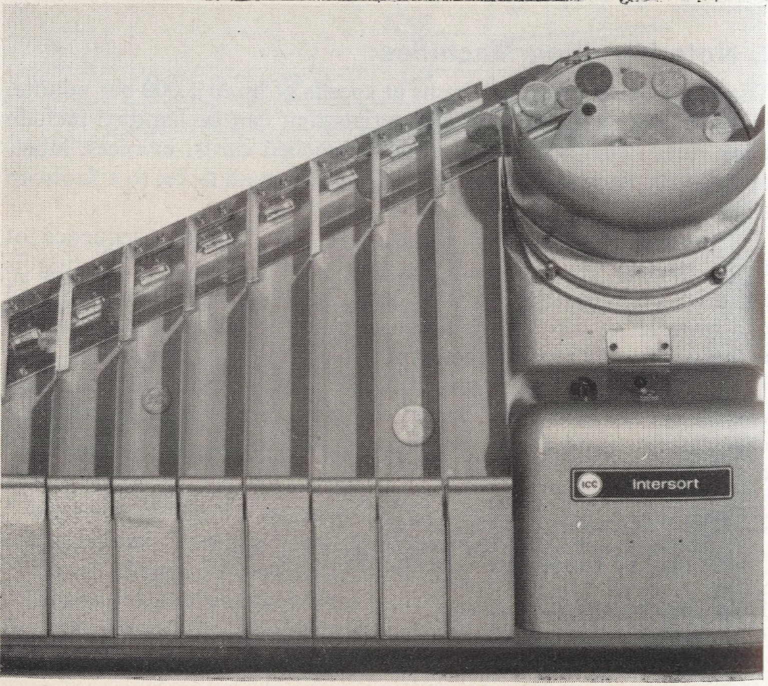
These may be subdivided into four sections.

Coin Sorters

Coin sorters are manufactured in two main forms—a light-weight machine which will separate all seven denominations of British



Machine for Counting and/or Imprinting Cheques, Coupons, Currency, Tickets, Labels, Etc.

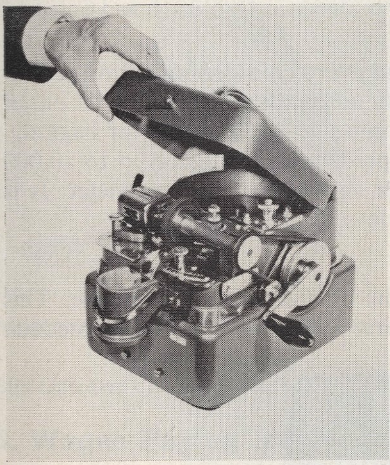

ICC intersort

A Coin Sorting Machine.

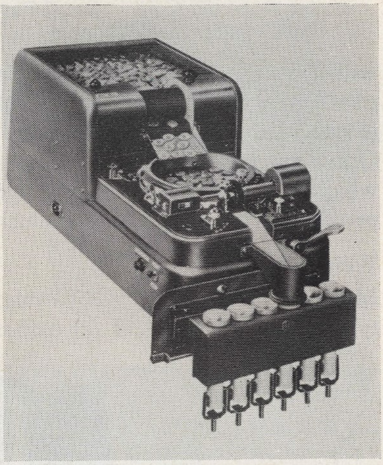
coins, and a heavy duty piece of equipment which can be supplied to sort either silver or all the seven coin denominations mixed, this being mainly required by banks etc. There are special arrangements of exits to suit operators of vending machines.

Coin Counters

Coin counting machines can be supplied in various forms, the simplest being a hand-operated device, suitable for counting any one denomination of coin. This will stop at predetermined quantities from five to one hundred. The same piece of equipment can be supplied with an electric motor. A more robust single denomination coin counting machine will count at an average speed of 2,000 coins per minute. When considering average speeds, it must be understood that sixpences go through the machine at the fastest rate, and half crowns at the slowest.



Hand Operated Coin Counter.

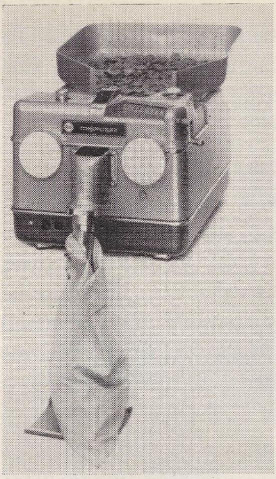


Power Operated Self Feeding Coin Counter with Automatic Stops.

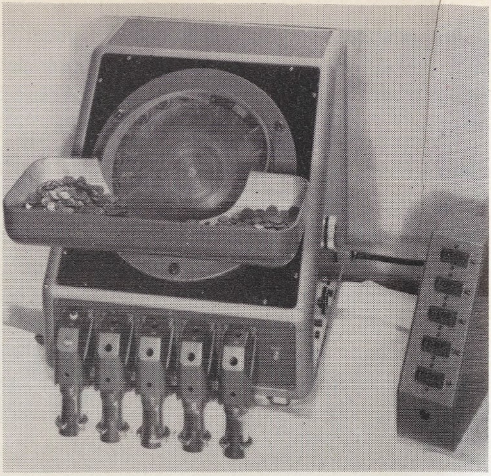
Stop mechanisms can be arranged in many combinations, from units of 5 into the 1,000's, for bagging. Another type can be set to stop at any number from 0 to 9,999. Coin counting machines are also available to handle most silver or mixed copper coins. Such machines are usually adjustable to accept any coins, metal or plastic tokens. Most machines include sub-total and grand total counting devices.

Coin Sorters and Counters

This type will sort and count mixed silver (or mixed copper and nickel) simultaneously at the rate of £2,500 per hour. The machine



Power Operated Coin Counter.

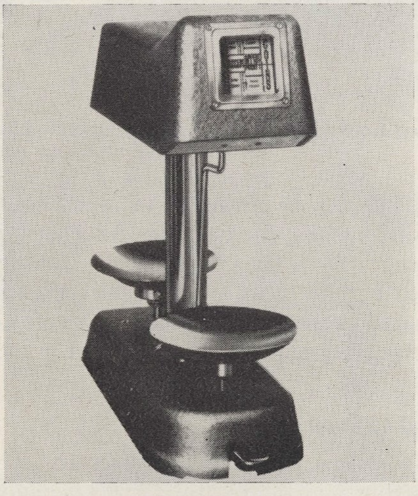


Small Power Operated Coin Sorter and Counter.

will show the quantity of each and every coin denomination individually at the end of the completely automatic run. Each coin outlet is provided with cut-out stops in units up to 1,000,000 for bagging. Other machines will stop at any predetermined figure up to 10,000 which can be set with one's finger tip on the counting meter. It is provided with automatic feeding device.

Weight Checkers

Money can be checked by weight on the balance principle. This type of machine is ideal for cashiers. A dial reading gives immediate

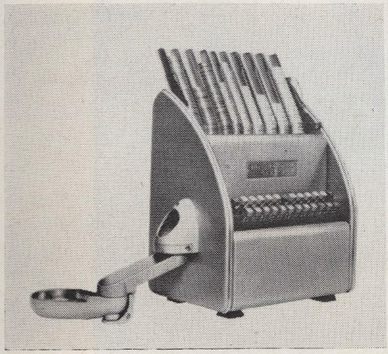


Weight Checker.

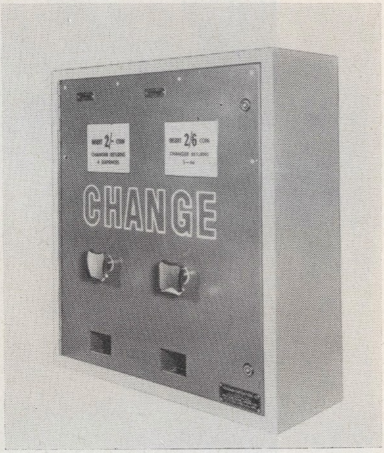
reference to accuracy of weight for various amounts of one denomination of coins or notes.

4. Change Giving Machines

Some machines will give change accurately at the pressure of one or two keys on a simple keyboard. The coin magazine is at the top of the machine and the various denominations of coins are held in separate compartments. One set of keys is for pence and another set for amounts of silver from 1s. to 10s. The amount of change required is rung up and in turn releases the various coins. This type of equipment can be obtained in variations to suit the needs of the user. Another type of machine operates by placing a coin into a slot which releases the same value in other denominations. This is of considerable value to vending machine operators.



Magazine Fed Change Giving Machine.



Slot Operated Change Giving Machine.

5. Wages Paying Machines

Where a large number of employees is involved, the making up of wage packets presents a particular problem in that the work normally has to be carried out on one particular day. Usually the notes are handled separately. The coins, however, can be dealt with by a machine similar to that first mentioned in the preceding section. This is adapted so that the coins are released into a wage envelope instead of a coin basin.

6. Cheque Machines

These may be subdivided into three categories.

Cheque Writing Machines

These are devices designed to increase the security and legibility of cheques. They replace the conventional amount line in words with a bold, indelible, embossed amount in figures which completely obviates any possibility of fraudulent alteration.

Machines range from a simple lever-set category, through a range of key-set hand and electric machines to a control centre unit which can write the amount line, add and list the amounts, count the cheques, date and sign them and deposit them in a locked vault. These units are controlled by four keys and operate at speeds of up to 1,000 cheques per hour.

REPEAT
CLEAR

Hand Operated Cheque Writer.

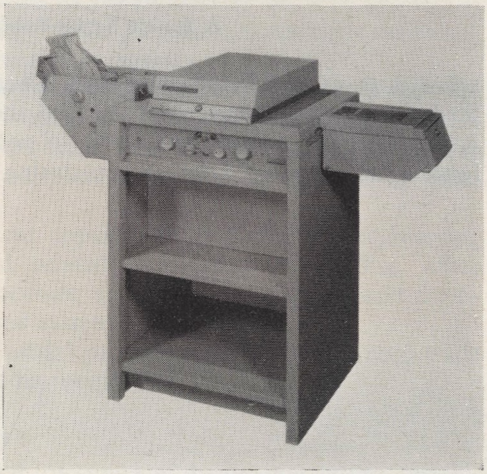
Cheque Signing Machines

These range from a simple hand-operated machine to a fully automatic unit capable of signing cheques at speeds of up to 2,000 per hour. They can be used to sign other documents such as share certificates, bills of lading, etc. They are controlled by at least two keys and a non-resettable counter which records the number of documents signed.

Cheque Sorting Machines

The use of MICR (magnetic ink character recognition) by the banking community as a common machine language for mechanized

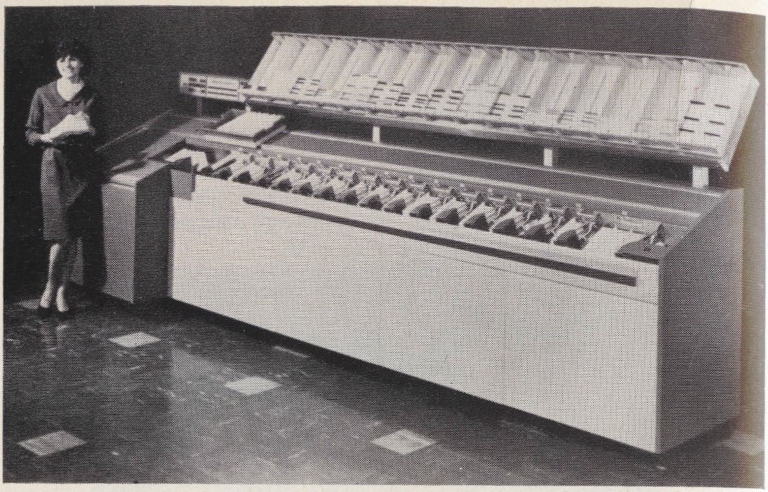
Hand Operated
Cheque Signer.



Automatic
Cheque Signer.

cheque handling has paved the way to a real advance in banking automation.

Today almost all the millions of cheques and other documents flowing through banking channels are processed through the use of MICR. Cheque sorting machines in this field are better known as "sorter readers," and have the ability to read 14 characters printed in magnetic ink which conform in size, shape and quality to the standards of the Office Equipment Manufacturers' Committee and the American Bankers Association. The characters consist of 10 numerical digits—0 through 9—and four special symbols. They are



A Typical Sorter-Reader.

referred to as the E.13B type font. Cheques (or documents) are loaded into a feed hopper and are read and sorted at rates of up to 1,560 items per minute into 13 or 16 pockets. Documents can be loaded and unloaded from pockets during the sorting operation.

CHAPTER 23

Office Reproduction Processes

This chapter will describe the main methods of reproduction processes, which today are generally classified as "reprography." Strongly interrelated as they are, each is a subject in itself and individually or collectively cover very wide areas of growing importance, influencing everyday operations. As a result of the great increase in the size and complexity of industrial units, coupled with the marked increase in the pace of commercial operations, there has been a parallel growth in the importance of visual communication, and techniques to facilitate their use.

Reprography

Reprography can be defined as *the production and reproduction of two dimensional visual image media for business, scientific, technical, manufacturing, and construction purposes.*

As any such brief definition could be considered either as too vague or too restrictive, it may be helpful to state that it includes *every* method of producing copies, from any type of original, in any quantity, and by any process, as a function of business or other administrative operation.

For Example:—document copying, reproduction of engineering drawings, microfilm and related techniques, duplicating, office printing and ancillary processes, and the use of copying and duplicating techniques in clerical systems.

It does *not include* industrial or commercial photography, trade printing or typing (except reprotyping).

The Scope of Reprography

In offices the constant need for copies of documents, letters, specifications, tenders, invoices, etc., to speed up operations generally is well recognized. There are many methods of catering for this need which include photocopying processes, as well as the production of copies by offset, spirit or other duplicating processes from a prepared master.

In the drawing office where diazo prints have almost completely superseded blue-prints, the demand for copies of drawings needs no elaboration.

Similarly, it is obvious to recognize the needs within the educational field, libraries, hospitals, local authorities, public utilities, etc. With the growth in importance of visual communications an accepted and established fact, the new appointment of Reprographic Manager has already emerged, and there is now an Institute of Reprographic

Technology. Reprography represents a new industry whose demands include not only a whole range of new products but also the specialized knowledge of those who sell them. It is a market that has grown and will continue to grow, swiftly, as well as in complexity.

1. Visual Communications

The introduction to this chapter, in defining reprography, stressed the importance of its use as a means of visual communication. Before proceeding further it is, therefore, necessary to elaborate on what is meant by visual communication, and to outline its use in business.

The first visual communications created were undoubtedly the pictures or images that man drew and carved on cave walls to record the circumstances of their time, some 5,000 years ago. Although far removed from methods in use today, these paintings and carvings told stories, many of which have survived the ravages of time, and have thus been "communicated" to us over the centuries.

Man has always found the need for visual communications and consequently they tend to be taken for granted. As a result of man's inventiveness the "story" may now be visually communicated by writing, typing, duplicating, printing, etc.

Before considering examples of how visual communications are created and used in the business context, it is important to establish whether they are themselves important enough to warrant consideration. One way to do this is to remove them, and to see what is left, and how civilization would get on without them.

Let the imagination range free and assume, as this manual is being read, it begins to lose its form, and to disintegrate into a dust that slips through the fingers and is lost in the pile of the carpet. Let the imagination range further, and assume that as this happens, mankind also loses for all time its paper-making capability.

In these circumstances, all that is left is memory, and word of mouth communications extended over distance by telephone and wireless telegraphy. Pictures could, of course, be transmitted by television but one could not transmit the written word in this way, because in these imaginary circumstances, paper would not be available on which to write the words. There would, of course, be no paper money, no agreements, no letters, no books of reference, no plans for architectural and manufacturing purposes. The realities of such a situation become evident after reflection, and it will be realized that visual communications are an absolute necessity to civilization.

In order to relate the importance of visual communications in business, it will be helpful to consider the basic structure of a business, be it a large manufacturing complex, or a shop in the High Street.

When a business is considered objectively there is a remarkable similarity to the human body (quite apart from the fact that a limited company is legally a person with a person's responsibilities in law).

A human body is made up of functional organs, all of which have to operate in mutual sympathy if the body as a whole is to function properly. To mention but a few of these functions: the brain, the nervous system, the liver, the legs, the five sense organs, and blood.

A business is also made up of functions. One has only to think about the functions that have to operate in harmony if the business is to be successful, to see the similarity.

Management is the brain; the telephones and close circuit television become the nervous system; production is equivalent to the liver which produces the body chemicals; transportation represents the legs that carry the goods; research and development, market intelligence and customer correspondence represents the senses; visual communications are the "lifeblood" of the business which carry messages to and from the various functions, to cause action to be taken, and the particular function to operate.

So, visual communications are vital. The proper management of them is as vital to the business, as is the heart to the human body. Visual communications must be "pumped" around the business efficiently and should be of the requisite content if the business functions are to operate efficiently. The management of visual communications becomes the heart of the business. Once the importance of them has been realized it is easier to understand their nature and why they are used.

That visual communications include posters, neon signs, signposts, car number plates and road signs, etc., need not concern this section, the object of which is to study visual communications in business.

The areas where visual communications are used in business are shown diagrammatically. The functions depicted in the circles, represent only a very few, exercised in a normal business, and then only in a very general way.

The dagger-like parts of the diagram represent the essential feed-back communications used to regulate the tempo of the business as a whole. By proper feed-back of information, gathered at the point of sale, or in the customer's premises, it can be used to change the operational nature of key functions. If, for example, technical modifications have to be applied in the field, it may or may not be beneficial to (*a*) do some market or product research and (*b*) follow that up with changes in production. If for example sales are falling behind forecasts then again (*a*) it may be necessary to alter the forecasts with all that that implies or (*b*) to change the marketing plan and maybe the immediate objectives of the company.

Even in this simplified diagram there are twenty-six areas where visual communications are used to interlink the functions. The

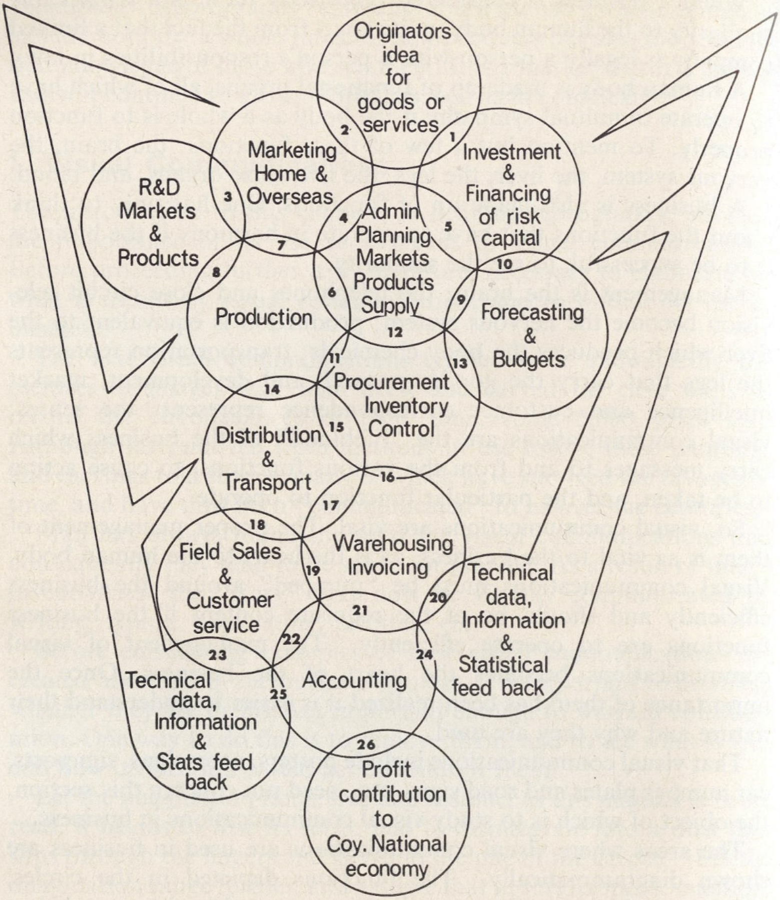

Originators idea for goods or services
Marketing Home & Overseas
Investment & Financing of risk capital
R&D Markets & Products
Admin Planning Markets Products Supply
Production
Forecasting & Budgets
Procurement Inventory Control
Distribution & Transport
Field Sales & Customer service
Warehousing Invoicing
Technical data, Information & Statistical feed back
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Diagram showing twenty six areas where two-way multi-copy links are frequently produced. Many of these can be sub-divided into products, markets, administration, personnel, premises, training, etc. To these must be added (1) functional links with overseas subsidiaries, associates, agents, distributors etc.; and (2) technical communications such as drawings, bulletins, and data on product and customer service, to and from all functional departments.

volume of these communications and their frequency will depend upon the size and type of business envisaged. Minor and transitory communications may be effected by telephone, so too, can the very urgent ones be dealt with; but sooner or later even these have to be notified in a way that men and women operatives can take in the information and formulate a decision.

The visual communications network, then has to be used to give effect to the decision.

By now it should be obvious that visual communications are analogous with the blood of the body. They carry messages to and from the functional organs—or the various departments and divisions of the company.

It is a fact of business life that human beings make the decisions. It is also a fact that decisions are made in the mind of man. It is also accepted that there are only five channels to the mind. If one is engaged in the perfumery, textile or the food and drink industries then the senses of smell, touch and taste have some local and specialized importance. More generally, the eye and the ear are the most widely used sense channels to the mind.

The ear can be used for minor, transitory and urgent communications by word of mouth, or when using telecommunications, but describing the diagram already shown by word of mouth is virtually impossible. Of the two most widely used channels to the mind, the eye carrying visual communications is the more important.

By using machines to create and multiply visual communications, the quicker they can be created and the more informative their content. Machines enable more people to have more information, more often and simultaneously, which they need to increase efficiency and productivity.

The processes and machines that can be used to handle the flow of business communications necessary, are described in the following sections of this manual. Some are more specialized than others that are designed to handle copying, duplicating and systems work, which often require that one document be changed into another to avoid the need and expense of transcription.

It seems hardly necessary to itemize the visual communications used in business when one realizes that everything from a short letter and a delivery note to a technical manual and sales brochure is a Visual Communication. However, it may be interesting to note the size of the visual communication problem that has tended in the past to have been taken for granted.

In the U.K. alone, during the next 12 months at least 40,000 million pieces of paper will be circulated in business circles. Without counting the cost of the duplicating intermediates, the need for which is reducing, these 40,000 million pieces of paper will cost £175,000,000 to produce. This figure does not include the cost of moving them from source to destination.

It is a sobering thought to realize that most of these pieces of paper will consist of the material contained on other pieces of paper.

2. Brief History of Copying and Duplicating

Generally speaking, the methods used in reprography, can be classified as a copying, or duplicating process. These terms need defining and a brief outline of their history given, before detailing the individual processes.

Until quite recently, there has been much confusion in business circles regarding these terms. Reference to dictionaries does not help in understanding them in the context of modern business practice. As a result of research amongst businessmen, it seems that it has now been tacitly agreed that the demarcation between the terms, arises not so much from the methods or machines used, but whether or not there is an intermediate, and the number of copies produced. If one proposes to make up to about five facsimile reproductions of an original, without recourse to an intermediate, then it is copying. If, however, twenty-five or more facsimile reproductions of an original are made by using an intermediate master, then it is duplicating.

The gap between the five copies and the twenty-five copies is the area where very often duplicators are misused as copiers and copiers are misused as duplicators. Quite recently a new range of machines have appeared which do both the copying and the duplicating, and so close the gap.

Until about the fifteenth century, the only method of reproducing an original document was by hand copying. The monks were mostly engaged in this kind of work. By that time a rational alphabet had been produced. More and more people were learning to read and write and a demand developed to have a personal record for reference purposes, of the books and documents used by the priests in religious services. In about 1440, Guttenberg invented the flat bed method of setting up alphabetical characters in metal type from which "copies" could be made. The demand for mass media communications and the cumbersome complexities of his process, discouraged its use in offices and directed its use to what we now know as letterpress printing. So printing came before copying as we now define the term.

Lithography, invented by Senefelder in 1796, depended upon an artist who could print and draw in reverse. The original process and equipment was first developed for artistic and industrial purposes. A century passed, together with the invention of other machines and methods of reproduction, before it became the versatile office process we know today.

From about 1800, the insistent demand for more personal and localized copying and mechanical writing facilities, caused many inventions to be sponsored which at that time were unrelated.

This demand was, no doubt, a direct result of the industrial revolution, stimulated by the rapid growth and expansion in all industrial and commercial spheres, communications, etc. Printing was entirely unsuitable for the quick and economic production of business documents, correspondence, etc. The history of modern copying and duplicating, therefore, commences from this period.

James Watt of Birmingham invented in 1760, his Portable Copying Machine. The document was written in copiable ink on well sized paper and allowed to dry. It was then placed in a press in contact with a sheet of dampened tissue. Under pressure, the ink image was transferred to the tissue. This was right reading through the tissue from the other side. The invention was the forerunner of the Letter Copying book of the nineteenth century. This consisted of 500 or a thousand leaves of strong tissue, capable of retaining its strength when wet. Copies were made as already described, oiled sheets being used to protect the other leaves during the damping and pressing process.

Carbon papers were introduced so that extra copies could be made of letters, invoices and despatches at the time the original was written. The first recorded use of carbon paper is noted in 1806, when Wedgewoods supplied a patented Stylographic Manifold Writer. It is not known how widespread was the use of this patent, but it is known that members of the constabulary used it in police work, for recording statements, passing messages and making notes.

This carbonic paper was very different from that in use today. Consisting of a porous sheet that had been soaked in a suspension of carbon black and then dried off, it was inserted between a transparent top sheet and a writing sheet, and behind this a writing plate. Writing was accomplished with a metal stylus. Pressure of the stylus on the manifold sheet, resulted in the carbon transferring to the underside of the manifold sheet to read the right way when read through the other side; it also transferred a right reading copy to the writing sheet. The former was retained as the copy, and the latter used for the outgoing document. As a point of interest, manifold duplicate books employing this principle, were in considerable use up to the late 1930s, and there is still a demand today.

In 1829 W. A. Burt produced the earliest known forerunner of the typewriter and called it the Typeograph. The Wheatstone typewriter was produced in 1856 and as the efficiency of these machines increased, carbon papers were used to make simultaneous file, and other copies.

The introduction of carbon paper for use with office machines can be attributed to an American, L. H. Rogers, who visualized its commercial possibilities when he saw some that had been made for a newspaper company by C. P. Dakin of Massachusetts; so much so that he commenced manufacturing it himself. In 1874, on seeing a demonstration of the first practical typewriter made by Sholes and Glidden and introduced by Remington, he persuaded the use of his carbon paper in the machine. The idea was successful although further development of the carbon paper was necessary. From the original mixture of lamp-black and oil, Rogers proceeded to use wax and hot-coatings on less porous paper and thus, the machine carbon paper industry became established.

Many attempts were made in the 1870s to find a suitable method of reproducing handwritten letters in quantity. Success came in 1881 in the form of D. Gestetners Cyclostyle. He employed a waxed paper stencil which could be punctured by writing upon it with a wheel-pen —a rotating, toothed wheel type instrument. The stencil was then fitted to a frame with the paper underneath, and ink applied to the stencil with a hand roller. Improvements to pen, stencil and apparatus soon followed.

The method quickly became known as "cyclostyling," and solved the problem of reproducing handwritten matter. However, the typewriter was now becoming established and the need was for a suitable stencil that could be cut on it. The most notable was the "Yoshino," which was a long fibred tissue, coated with wax. It was, however, a fragile material and not entirely successful since the centre of the loop letters often fell out.

The duplicating machine developed from the flat-bed style to rotary, the first twin cylinder machine being produced by Gestetner in 1902. About that time a single cylinder machine appeared in America which used a system of internal inking. The proposed name—Neostyle—precipitated a Court action which Gestetner won, and the machine became known as the Rotary Neostyle, later abbreviated to Roneo. Soon, gelatine stencils superceded the wax variety and in 1928, the nitrocellulose stencil, which is still in use.

Before leaving stencil duplicating it is convenient to mention a more recent development. Typewriters cannot of course, produce diagrams, but today it is possible to make a facsimile stencil from any existing original by means of electronic scanning equipment. The method emanated from facsimile transmission work begun in America in 1920, although it was not until 1950 that the first electronic stencil cutter was marketed.

Spirit duplicating also goes back to the 1880s. The original invention was known as the Hectograph, attributed to the claim of 100 copies per master. Originally, the document was written in copying ink and dried. It was then placed face down on a slab of gelatine to produce a reverse image, and copy paper pressed against this to produce a right-reading image. Clay compositions were also used to receive the reverse image. The process developed and the early 1900s saw the introduction of reversed carbon images and spirit damping, the first practical machine being marketed in 1923 by W. Ritzerfeld, founder of Ormig in Berlin.

Alois Senefelder is credited with the invention of planographic or lithographic printing in 1796, later to be developed by Robert Barclay in 1876, into the offset litho process. Although this was the first commercial development, J. Strathney patented the offset principle in 1853. Barclay's development, for some thirty years was used for metal printing, notably tin. Although using the offset principle, the tin printer regarded it as a "direct" method since prior to this, the design was printed on to a transfer which was then applied to the metal.

The first presses were flat bed, but 1890 saw the introduction of rotary type presses, made possible by the use of thin metal printing plates. Again the tin printers made use of the development and in 1905 rotary offset machines were used for metal printing. Very soon afterwards the Rubel and Harris brothers independently developed offset rotary machines for paper printing.

From this time onwards continuous progress was made, particularly in America. Small offset machines appeared on the scene in the late 1920s to bridge the gap between trade printing and office duplicating. By the early 1940s it became an accepted method of reproduction in the office. This was due in no small measure, to the introduction of direct image master paper plates, which meant that the user no longer had to rely on metal plates imaged photographically. These plates could be prepared by directly writing, drawing, or typing on them. In singling out this particular development, it should not detract from the many others in machine design, inking and damping systems, photography, platemaking techniques, etc., all of which have contributed to the position that offset litho holds today as a method of reproduction in the office and in-plant printing department, in addition to being a major trade printing process.

In the latter part of the nineteenth century, as the machines and processes became more efficient, convenient and practical, businessmen interested themselves in using these inventions in combination to solve some of their visual communication problems. They had by now an efficient mechanical writing machine, they had carbon paper with which to make a few instantaneous copies, they had a rudimentary offset litho machine and they were keeping their eyes on photographic developments.

The mechanical writing machine or typewriter was used to cut stencils and to produce spirit masters. So duplicating in offices got into its stride. The limitations of the typewriter highlighted the problem of reproducing diagrams and pictures. The stencil and spirit method gave businessmen some relief from their problems by adapting to produce diagrams, but none of these processes were really suitable for short-run reproductions.

In 1837 L. G. M. Daguerre produced a camera and a very slow "photographic" process using silver iodide. Fox Talbot in 1839 worked on alternatives to silver iodide, and in 1841 photography got into its stride as a laboratory process, and in due course, commercialised.

Before about 1929, photography was mainly used for taking pictures and was not used extensively in offices. By 1929 photographic technologists had been successful in simplifying the process, and making it more suitable for office use. It passed through the direct, reflex, direct positive, diffusion transfer and gelatine transfer stages. It was a boon to businessmen who received a duplicated memorandum containing diagrams and who wanted a few extra copies. Without photography, retranscription was necessary or the recutting of a stencil, and the redrawing of the diagrams on the new stencil would have been necessary to produce even two or three copies.

To briefly review the history of photocopying, it is necessary to commence with the Photostat process since during the early 1900s, it was practically the only method of obtaining copies of business documents. It employs a camera with a prism to reverse the image so that it produces a right reading, white on black negative. This requires photographic processing in a darkroom. Originally the idea of G. C. Beidler of Oklahoma, who formed the Rectigraph Co. in 1906, it was subsequently marketed by the Photostat Corporation; the copies produced became known as "photostats"—a name now very often used erroneously for other types of copies. Beidler's company was eventually bought out by the Haloid Corporation, now the Xerox Corporation. However, copying by optical equipment was for many years an expensive business and not suitable, nor sufficiently economical, for general use.

The first method employed in making photographic copies without the aid of a camera was contact copying. This requires a translucent original, imaged on one side, which is placed in contact with the photographic paper and exposed to light in a simple light box. Since the light was transmitted through the original, it was not possible to copy opaque or double sided documents; this requirement had to wait for reflex copying.

The reflex copying method seems by general consent to be attributed to J. Hort Player in 1896. However, it seems that the real originator was an Albrecht Breyer who on 14th August, 1839, produced for the Brussels Academy of Science, prints from originals which were themselves printed on both sides and therefore could not be produced photographically by using transmitted light as hitherto. These prints he called "Heliographs." A French scientist named Arago presented Daguerre's method of photography to the Paris Academy on 19th August, 1839. Breyer's discovery was generally forgotten until it was rediscovered by P. Yvon in 1891 and was neglected until Player reintroduced it, at which time it was known as the "Playertype" process. This name persisted until about 1940. Player used silver bromide but Max Ullmann in 1913, produced a process using a chrome gelatine emulsion. This was called the

"Manul" process. The modern name for all these processes is reflex copying and it was first used commercially in about 1929 for copying documents. It produces a mirror image of the original from which a right reading positive is taken. The principle is used in several of the photocopying processes.

The direct positive method came to the forefront in the commercial world in about 1940 when Gevaert marketed a paper for the process. A simplified version of the system was introduced to use Kodak's autopositive paper.

Diffusion transfer is a one stage process employing negative and positive papers in contact with each other under pressure to produce a positive image. It is not known exactly when the process was invented, but it is known that direct reference to the possibility of using this technique was made in 1857 by B. Lefevre, who transferred an image on to a sheet of gelatine coated paper. The next reference to this method appeared in 1898 when Liesengang transferred an image from one plate to another using diffusion techniques. Although some work was done on this process by various people between 1924 and 1938, it was not until the early 1940s that the process became successful. A. Rott registered a patent in 1939 and his developments were commercialized by Gevaert in Belgium. Dr. Edith Weyde also made a commercial success of a similar process she invented, when the German Company of Agfa took up her invention. Kodak have also done considerable research into this process and market their own materials for using it. Diffusion transfer copies are of very high quality and although the process is complex, the method of operation is quite simple.

The gelatine transfer method, widely known under the Kodak trade name of Verifax, was probably invented by Fox Talbot in 1852. J. W. Swan in 1864 patented a method of making carbon prints by the method based on Fox Talbot's findings. Not very much use was made of these technical discoveries until 1952 when the Verifax process was developed by research workers at the Eastman Kodak laboratories in Rochester, New York.

The diazo process is far from new, and was introduced since the end of the first World War; it replaced the former blue-print processes which used ferric salts and ferricyanides. The first really successful diazo process was developed in the early 1920's by Dr. Gustav Kogel, a German professor of photochemistry and a former Benedictine monk.

The diazo or dyeline process although known scientifically in 1875 was patented by Ozalid in 1921. Originally it solved the expense problem involved, when the photographic process was used to copy engineering drawings. It began to be introduced as an office copying process about 1950. It certainly solved some problems that surrounded the photographic copying process, but added other problems associated with its own need to use translucent originals. Not all the originals that were required to be copied arrived conveniently on translucent paper. Furthermore it was not suitable for copying double-sided original documents, or pages from bound books.

The thermographic process using infra-red radiation was developed by the Minnesota Mining and Manufacturing Co. Chemical reaction to heat was known for many years, but it was Carl S. Miller who used it for a copying process in 1940. Considerable work was necessary to find the right chemicals and to design a suitable lamp and machine and the first model did not appear until 1944. Improved papers and machines were introduced in 1946 and 1950, and the first desk model in 1956. It was immediately successful, and became the most popular process of the time.

Copiers using this process were fast and very convenient but they, too, had their limitations. They could not reproduce red, nor could they copy originals, the images of which, were made up from non-metallic inks. The sensitized paper discoloured if warmed and was flimsy. The diathermic or dual spectrum process followed. It was designed to overcome the blindness of the heat process to non-metallic inks, and red by the use of ultra-violet light as in the diazo process, and to combine this method with the speed and convenience of the heat process. Other variations of the ultra-violet and heat processes combined with a tacky transfer method called adherography, appeared but have not yet found the same widespread use.

The invention of the electrostatic process ante-dates some of the more recently introduced processes mentioned above, as it was invented in 1938 by Chester Carlson who had the help and advice of the Battelle Memorial Institute in developing it. The Xerox Corporation negotiated for the rights in 1946. It was not until the early 1950's in America and the late 1950's in Europe, that machines using this process became widely used. The early machines were manually operated and designed, primarily to produce excellent and inexpensive offset masters and had enlargement and reduction facilities. It could also produce copies on normal office stationery, rather than on the specially sensitized papers associated with the other processes mentioned. In this respect it constituted a major breakthrough in the office copying field.

Automated copiers using the electrostatic process appeared in this country and in the European market in 1960. These machines were very simple to operate and very convenient to use in offices in that they only required the original to be laid down, the number of copies required to be dialled and the machine to be started.

This major breakthrough attracted enormous interest and its success encouraged others who, up to that time had supplied machines using the other processes, to develop alternative electrostatic machines.

The original electrostatic principle employs a selenium photoconductor. Another electrostatic process uses a zinc oxide coated paper for the photoconductive surface—generally called "direct electrostatic." This process grew out of the work conducted at the Battelle Institute and was developed by the Radio Corporation of America. Manufacturing rights were subsequently granted to other companies, and machines were marketed in 1961.

Following development of the initial patent, the term "xerography" was invented to describe all processes involving the utilization of the photoconductive medium for electrostatic images.

3. Division and Choice of Process

This section is intended to serve as an introduction to the principal reprographic processes dealt with in the following sections, by outlining the main divisions and commenting on certain factors affecting the choice of process.

Copying Processes

These processes, which are used to make a limited number of copies of an original document, fall into two divisions. In groups 1 and 2, given a suitable original, a copy can be made without having recourse to an intermediate or master when the original is both translucent and single sided. In groups 3 and 4, the original may be opaque and double-sided.

(1) Photographic. From a translucent single-sided original a right reading copy can be made directly by contact. If the original is opaque or double sided then an intermediate stage giving a mirror reversed copy is necessary.

(2) Diazo. Copies can be made directly from translucent single-sided originals, or from intermediates (made by a different process) prepared from opaque or double-sided originals.

(3) Heat. Copies can be made directly from all types of originals.

(4) Electrostatic. Copies can be made directly from all types of originals.

All depend upon some form of radiation, either light or heat, in the cycle of operation to produce the finished copy. Other processes although sometimes claimed to be special or different, are in fact variations of one of the basic processes.

For example, within the photographic process, there are the reflex, direct positive, diffusion and gelatine transfer processes. These have all been developed from the original photographic process. Heat processes include infra-red direct and transfer; the dual spectrum method involving light as well as heat; and adherography. Similarly there are two electrostatic processes which have been developed from the original process. For the purpose of this chapter these subdivisions do not affect the divisions of copying processes, and each are dealt with under the appropriate basic process.

It should be noted that microfilming, although a photographic process, is dealt with as a separate section, since its application to copying is rather different from the remainder.

Duplicating Processes

These processes require a specially prepared intermediate or master. They are used where a larger number of copies are required, and include:—

(1) Spirit Duplicating.
(2) Stencil Duplicating.
(3) Letterpress Duplicating.
(4) Offset-litho Duplicating.

The actual number of copies that can be produced varies, according to the process employed.

Spirit duplicating is not intended to produce more than about 500 copies and is usually chosen for work needing considerably less than this figure. Stencil duplicating, provides for up to 5,000 or more copies, and the latest electronic stencils are claimed to be suitable for runs of 10,000 copies.

Letterpress duplicating has virtually been superseded by the offset-litho process. Although included, it is only dealt with briefly.

Offset duplicating can be employed for producing as few as 5 copies from each master on systems machines, to as many as 100,000 on other type machines, dependent upon the type of master, quality of image and method of producing the image. Plates used by the professional printer or large in-plant department are capable of giving very much longer runs.

Both letterpress and offset-litho duplicating processes, are developments of those already described in the chapter covering Printing Processes generally. The essential difference is that the printing machine journeyman is fully trained, having served an apprenticeship and is, therefore, capable of operating larger and more complex machines. Whereas, operators of the smaller office offset duplicating machines, do not need to serve an apprenticeship and can be trained in a comparatively short period.

Small offset duplicating began as an elaboration of other duplicating methods, but although its equipment is modest by the standards of larger printing machines, it has long since ceased to be a part time occupation.

At first, the process was used to fill the gap between stencil duplicating and printing. However, the comparative low cost of equipment and production, simplicity of operation, speed, compactness, versatility and ability to reproduce half-tone, meant that illustrated matter as well as general office stationery and forms, etc., could be turned out rapidly in quantity and at modest cost. This progress was made possible by developments in the field of photography, copying processes, and method of copy and master preparation.

Choice of Process

Copying and duplicating is big business and new ideas and techniques are continually being introduced. The more obscure processes are not dealt with; the more usual are only dealt with briefly, since it would be impossible to cover the subject exhaustively in a book of this type. It should be noted also, that it is impossible to detail the advantages and disadvantages of one process over another, because certain machines working in one process will overcome one set of disadvantages, but may in turn produce other disadvantages. Furthermore, in certain areas, disadvantages are only of significance in the sense of application to which the machine may be put, whereas, with other applications, these disadvantages disappear. Advantages and disadvantages must be comparative and there is no absolute criterion. Immediately one begins to compare one process with another, the difficulties become almost insuperable. In addition, the eight processes detailed involve several hundred machines, made or distributed by a large number of manufacturers or agents, all of whom, quite naturally, claim process and cost advantages over competitive makes. Since the economics of process selection, make and type of machine, copy cost, etc., is not considered a requirement of this chapter, no attempt will be made to give comparisons. The latter are regarded as commercial facts, obtainable from the makers and other sources, whilst the prime purpose of the chapter is to detail the processes as objectively as possible.

However, to assist in selecting a particular process, it is necessary that one should have some factors against which the merits of a particular process may be considered.

Cost and Flexibility: The cost factor may be divided into the initial cost of the machine, and the reproduction cost of the copies. It is not always true that the cheaper the machine, the less expensive are the copies; this is often the reverse. Flexibility is important in that requirements over a period of time often change. A machine ideally suited to current requirements, may not be flexible enough to deal with needs that arise some time later. In this event, additional capital expenditure would be necessary.

Some machines are available on a rental basis. This saves initial capital outlay and in addition, allows the machine to be changed from time to time for a later model, and only incurring moderate alteration to the basic rental.

Source of Original: This is the next important factor to consider. Is the machine intended to cater exclusively for documents received from outside sources? If so, consideration must be given to the variety of documents likely to be received. For example, single or double-sided sheets; bound pamphlets, magazines, books, etc.; whether or not they are in colour; whether photographs will be included. Not all processes are suitable for all types of original. Size of original is also important. If a significant proportion are oversized then a machine incorporating a reduction ration may be necessary, if the output is to be of normal dimension. Alternatively a large-size machine will be required.

If the machine is intended to cater exclusively for internally created originals, then these considerations are less problematical, as the material, size, colour, etc., is under the absolute control of the user, who can arrange for all these factors to suit the process and machine chosen.

In the case of duplicating processes, it must be remembered that masters have to be made. There are many different methods according to process and type of master, each with particular characteristics. Preparation of originals and masters can involve equipment in the high cost category, dependent upon the results required.

Quality of Output: Again, this depends upon whether copies are required for internal or external use. If the machine is intended to cater for internal visual communications, then clarity, speed, versatility, and economy will be important factors. If, however, the output is for potential customers, sales promotion, etc., requiring prestige characteristics necessary to impress, then nothing but the best is likely to be be required.

Number of Copies: With some processes, the cost per copy is a fixed amount per copy, irrespective of the run length. With others, the more copies produced from any given original or master, the less expensive each copy becomes.

Permanence: Not all processes produce permanent copies. When the copies are required to last for an indefinite period of time this is a major factor.

Space: If the equipment is to be operated efficiently, adequate operating space and storage facilities for supplies is essential. This is important for all types of machines. Coupled with this factor are those concerning light, heat, ventilation, etc.

Machines: Although the process is by far the major importance in selection, some consideration to the machine is necessary. Copiers may be rotary or flat-bed types. These terms indicate whether the original has to be fed into the machine, or merely lies on a flat platen while it is copied. The flat bed are perhaps more versatile in that they can accommodate bound books and rigid materials. The rotary types bend the original around a drum or similar device within the machine, whilst it is being processed.

Almost all duplicators are rotary machines in which the master is fixed to the drum or cylinder. The few flat-bed types available are generally manually operated to produce a few copies and are used mainly for private purposes.

Machines generally incorporate a number of devices and vary in design and appearance. The simplicity of operation is important, as is the correct training of staff to operate the machine. No special skills are required, but experienced operators can do much to ensure quality of output and maximum production.

Copying and Duplicating Requirements: If only one type of copying or duplicating requirement is needed then the selection process, bearing in mind the factors already stated, is considerably reduced. However, where the requirements cover a variety of needs, the process must be one that is able to cope with the majority of the work; alternatively two processes must be considered, which can be used separately, or in conjunction with each other.

If the copying and duplicating requirements are each in themselves not of sufficient volume to keep both machines at economical running levels, then all other factors being equal, a combined copier/duplicator may be the answer. These machines need only one operator, whereas machines specializing in separate functions often require separate operators. Similarly, the total copying and duplicating load combined, may not be sufficiently economical to warrant the use of such a machine. In this case a machine designed to work with systems and masking templates may be the best choice. Its increasing usage will make it more economical for copying, duplicating and systems work.

Other Considerations: The factors affecting the choice of process are rather more extensive than would appear at first sight. Consideration should not be restricted only to the elegance of the process, its convenience, speed and economy although these factors are important.

Obviously, reliability is important but sooner or later the most reliable of machines need the expert attention that the operator is not always able to give. The proximity of a service depot stocked with parts, and staffed by mobile experts is an important consideration; even if the suppliers of a process having these local facilities, means that the cost per copy is a few tenths of a penny more. The greater number of these local service facilities dotted around the country indicates that the supplier is more conscious of his customer's needs than those suppliers who perhaps have only one or two of these service centres.

The experience, reputation and standing of the supplier in the market is important but this is often not considered prior to purchase. Many suppliers offer very extensive after sales service, not only for repairs and adjustments but also for operator training, and advice regarding the extended use of the machine in unusual circumstances—but, is this service offered without extra charge? If not, how much will it cost?

The convenience of one process is very difficult to express in terms of pounds, shillings and pence because individual users place a different value on the convenience factors. In some cases speed of output may be worth a few tenths of a penny more on the cost per copy. Similarly, copy wastage due to errors of judgement of exposures may be important. The delays due to the need to change developers, or wait for them to be warmed up to their operating temperatures after topping-up, may also be significant in certain circumstances. The delays, special skills, specialized equipment associated with the creation of specialized intermediates can, in many situations, be a significant inconvenience.

In summarizing it is fair to say that there are quite a number of prior decisions to be made in anticipation of the acquisition of a copier or duplicator quite apart from the operational merits and commercial considerations of the process it uses, to produce the results required.

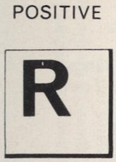
4. Photographic Processes

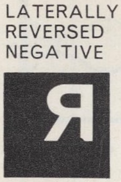
Photographic document copying systems are commonly used throughout the whole of commerce and industry, as well as in government, research and medical organizations. The main advantages of using photographic systems to copy documents are that they save time and are completely accurate and reliable.

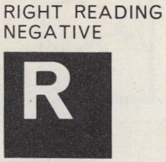
The material to be copied is known as the "original." There are several different types: line originals, such as printed matter or line drawings, containing only two tones, a light one and a dark one; continuous-tone originals, such as photographs and paintings, having a graduation of tones between extreme light and dark and half-tone originals which are pictures reproduced in the familiar half-tone dot pattern seen in newspaper and magazine illustrations. There are various systems of making photographic copies of these originals, and equipment and sensitized materials have been developed specially for the purpose.

This section deals mainly with conventional photographic processes—in other words processes which depend on materials containing light-sensitive silver salts, and which produce copies by the action of light on a sensitized emulsion. These processes work in the same way as those which produce the familiar snapshot for the family album. However, there are systems that use silver sensitized materials for the intermediate master or negative stage only. Copies are then produced on a non-silver sensitized paper.

Most photocopying processes consist of two stages; the first involves making a negative having an image which is reversed both in tone and in lateral position (as in a mirror); the second produces a positive from the negative which is a faithful reproduction of the original. There is another method of producing negatives which are reversed only in tone and are therefore quite readable. These are called right-reading negatives. Also, using special techniques and materials, it is possible to obtain a positive image directly from the original, using only one sheet of sensitized paper.







Photocopying methods fall into two main categories, contact copying and camera copying. The difference is that contact copies can only be made the same size as the original, whereas, camera copies can be reduced or enlarged.

Contact Copying

Two main types of contact printer are used for contact copying.

Flat-bed Printers: In these, the papers are held together on a flat sheet of glass. They are then exposed to a light source integral in the machine.

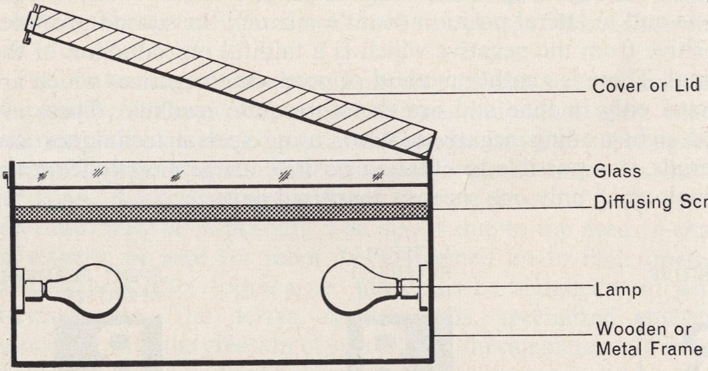
This system will give a very sharp image, providing that good even contact is maintained between the original and the copying material.

There are several different types of flat-bed printer available and some include certain refinements such as a vacuum-blanket to keep the original and copying material in intimate contact during the exposure. These are recommended if lithographic printing plates are to be produced, since they will ensure sharp results. However, they all consist of the same basic parts which are shown in the diagram.

Rotary Contact Printers: In these, both original and copying paper are transported, by means of rollers, past a light source. This light source is usually a fluorescent tube built into the machine. The exposure time is often controlled by a variable shutter around the fluorescent tube.

While the contact obtained with rotary contact machines by these rollers is sufficiently good for general document copying work, it is not good enough for highly critical work, where maximum resolution is required, *e.g.*, in the preparation of litho plates, etc.

Processors are normally integral in the exposing equipment available commercially.



Basic parts of a Printing Box.

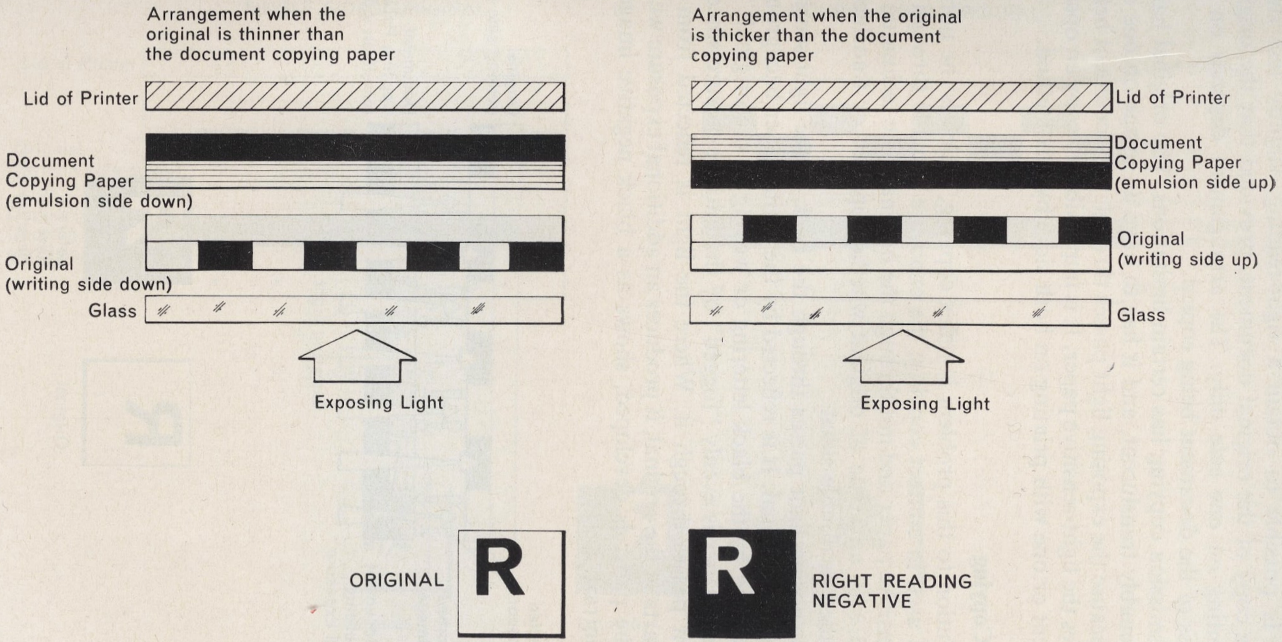
Materials: All materials used in contact copying have a light-sensitive coating on their surface, similar to those used in normal photographic films and papers.

Document papers suitable for contact copying should be light-weight and be fairly translucent. The emulsion should be of fine grain, high contrast, and orthochromatic (sensitive to all colours of light except deep orange and red). This allows the use of yellow printing screens in some techniques and also to facilitate the copying of old or yellowed originals. Document papers can usually be handled in subdued room lighting; others, of projection-speed, by the light of a safelamp fitted with a suitable safelight filter.

Transmission Contact Copying

Contact copying is the method by which the first photographs were made over a century ago. The method is quite simple. The original, which must be translucent, may be a single-sided document on translucent paper. It is put on the glass plate of a printing box, printed side up, and covered with a sheet of light-sensitive document copying paper emulsion side down. The "sandwich" is then exposed to light. After developing and fixing the paper, a negative image results. Repeating the procedure with the negative and a fresh piece of light-sensitive paper produces a positive.

This method of contact copying is often referred to as transmission copying because the document paper is exposed by the light that has been transmitted through the translucent areas of the original.


Arrangement when the original is thinner than the document copying paper
Lid of Printer
Document Copying Paper (emulsion side down)
Original (writing side down)
Glass
Exposing Light
Arrangement when the original is thicker than the document copying paper
Lid of Printer
Document Copying Paper (emulsion side up)
Original (writing side up)
Glass
Exposing Light
ORIGINAL
R
R
RIGHT READING NEGATIVE

Transmission Copying Arrangements.

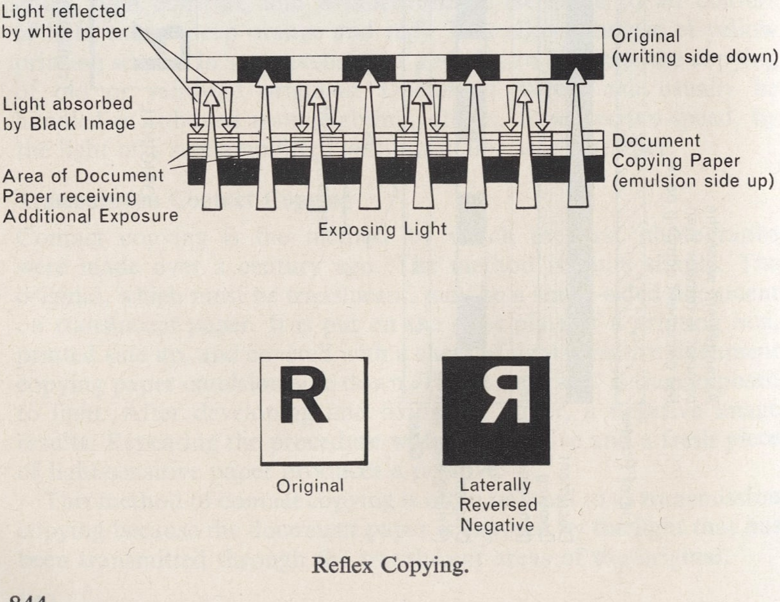
By arranging the light-sensitive paper and the original in a different way, it is possible to obtain a right-reading, slightly less sharp negative copy of the original document, provided that the original has printing on one side only. The arrangement depends on the thickness of the document being copied.

Transmission copying has certain limitations. The original has to be reasonably translucent, and it has to have an image on one side only, because the exposing light passes through the document before it reaches the light-sensitive paper. It is impossible to copy an opaque document or one with printing on both sides by this method.

Reflex Copying

The solution to this problem is reflex copying, which is the normal method used in contact copying; the exposure is made through the light-sensitive paper and not through the original. The technique can be used with any type of original whether opaque or translucent, single-sided or double-sided.

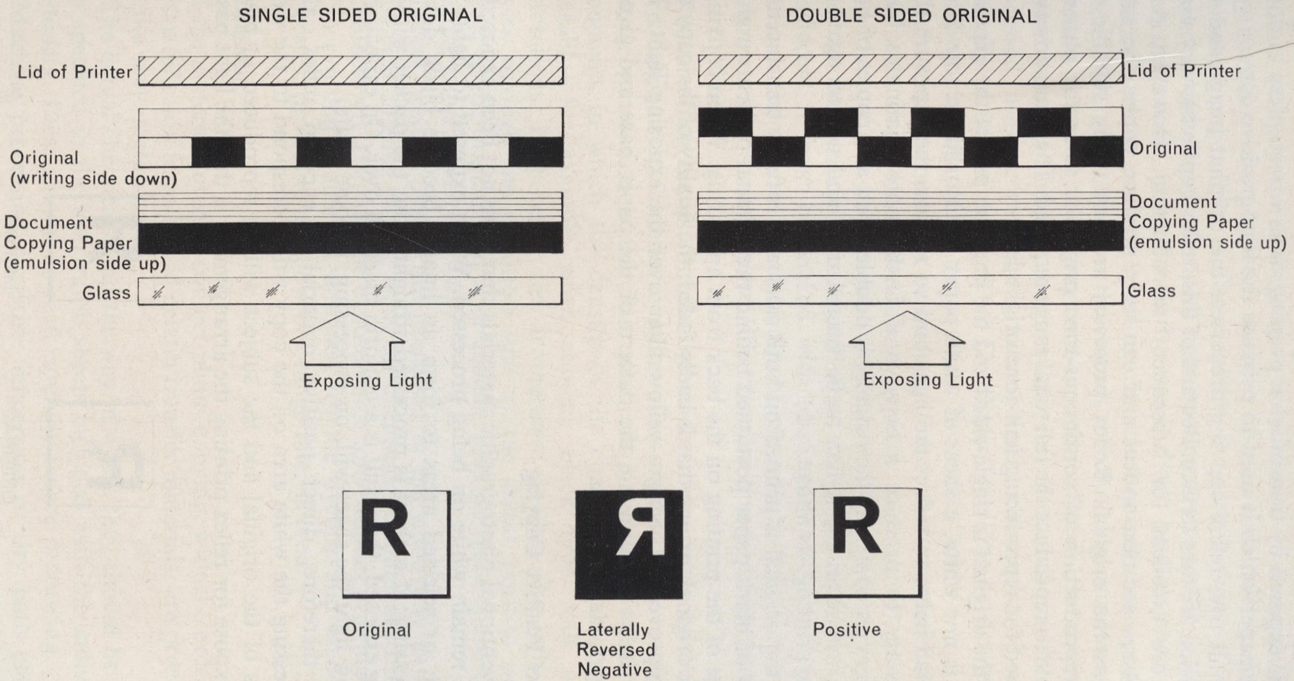
The exposing light passes through the back of the light-sensitive paper to the original. It is reflected by the white paper background, but absorbed by the black lettering or writing of the original. The document paper is evenly "fogged" by the initial exposure since all the light passes through it. Where the light is reflected from the white parts of the original, it produces an additional exposure which, when the paper is developed, shows as a black negative image of high contrast.


Light reflected by white paper
Light absorbed by Black Image
Area of Document Paper receiving Additional Exposure
Original (writing side down)
Document Copying Paper (emulsion side up)
Exposing Light
R
Я

Original

Laterally Reversed Negative

Reflex Copying.


SINGLE SIDED ORIGINAL
DOUBLE SIDED ORIGINAL
Lid of Printer
Original (writing side down)
Document Copying Paper (emulsion side up)
Glass
Exposing Light
Lid of Printer
Original
Document Copying Paper (emulsion side up)
Glass
Exposing Light
R
Original
R
Laterally Reversed Negative
R
Positive

Reflex Copying Arrangements.

To obtain a positive copy, the negative copy is used as the original, and is exposed by transmission printing onto a fresh piece of document paper which is used to produce the final positive copy.

In all true reflex copying processes, the original image and the emulsion are face to face. Because of this, reflex copies are very sharp and are excellent for subsequent reproduction. However, these processes are non-optical and can only produce copies the same size as the original. Reflex processes are not really suitable for the reproduction of continuous-tone originals, since the paper is unable to reproduce the full tonal range required. They can, however, be used for reproducing half-tone originals.

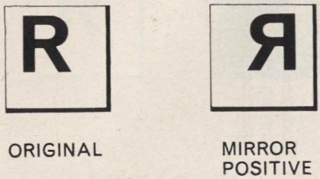
If the original is single-sided and the pressure pad of the exposing unit is not white, a sheet of white paper positioned on top of the original helps to reflect the light and so reduces the exposure time necessary to produce a copy, and furthermore eliminates black borders on copies. If the original is double-sided and copies of both sides are required, it has to be turned over and copied again by reflex printing, as above.

If the original is printed on both sides and is fairly translucent, a sheet of black paper postioned behind the original prevents a ghost image of the printing on the back from appearing. When copying a weak original, or one that is badly faded, the quality of the copy can be improved by using a yellow filter over the exposing light. The filter helps to eliminate the pattern of the paper base and gives a sharper, clearer image.

Direct Positive Copying

Conventional photographic materials that have not been exposed to light remain white on being processed. When exposed to light, the sheet, or selected areas to form an image, become black during processing; if a sheet is processed straight from the packet without being exposed, the result is a uniform black all over. On exposure to yellow light the sheet will, on processing, become white.

If therefore, direct positive material is exposed reflex, after processing the white area on the copy will correspond to the white areas of the original and the subject will be reproduced in black. To expose for reflex printing the arrangement is that the light passes



through the back of the direct positive material, which has its emulsion in contact with the subject to be copied. Consequently the copy is a mirror image, but as the direct positive material is usually translucent paper (film is also available for certain types of work connected with drawings, maps) right-reading copies can be made by the diazo process, or by the further use of direct positive paper.

Because of the unusual handling characteristics of direct positive materials, if, after exposure the copy is too dark, exposure must be increased; if too light, the exposure must be reduced—the reverse of normal practice. The papers are usually very slow, and may be dish processed using conventional photographic chemicals, or automatically processed using either Developer/Stabilizer or Activator/Stabilizer chemistry. (See the notes on Processing below.)

Right-reading copies can be made on direct positive materials from translucent single-sided originals, by contact transmission printing, but with opaque or double-sided originals the reflex method must be used. In the event of an original that is both double-sided and translucent it must be backed with black paper to suppress the details on the reverse. An advantage of exposure by reflex is that for documents of a similar colour, the exposure time is independent of their thickness.

Right-reading copies can also be made from opaque or double-sided originals by bi-reflex copying. This method gives a slightly lower contrast and is therefore particularly suitable for copying documents in which the density of the characteristics vary considerably—for example when copying black type with pencil annotations. In bi-reflex the arrangement is that the light first passes through the emulsion side of the direct positive paper, thence to the original that is in contact with the back of the direct positive paper. (See page 848.)

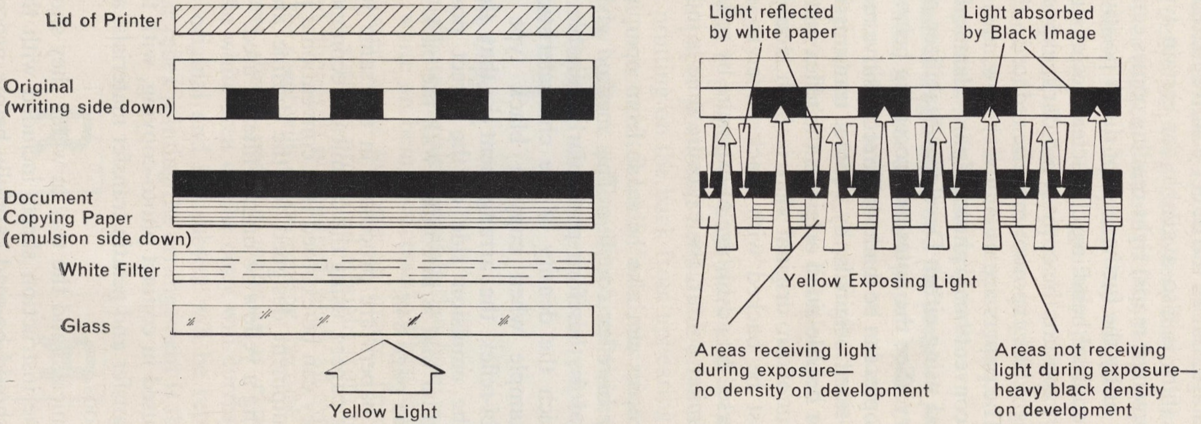
Direct positive papers are processed in the same way as other document copying papers, using the chemicals recommended by the manufacturer. They can be exposed in a conventional printing box, or in printing equipment designed for the dyeline and blue-print processes, providing a yellow or orange filter is used.

Processing

All the materials used in contact photo-copying, with the exception of the diffusion transfer and gelatin transfer materials, are processed by the same methods.

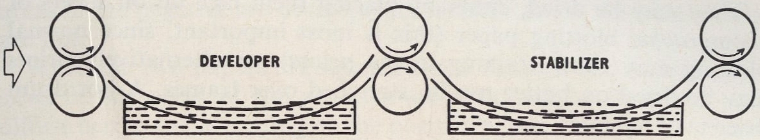
The actual chemicals, and the way in which they should be used, are specified in the instruction sheets included with the individual materials. These should be read carefully before processing.

Machine processing, in either immersion or dry path (surface application) equipment, is commonly used. In these machines, the

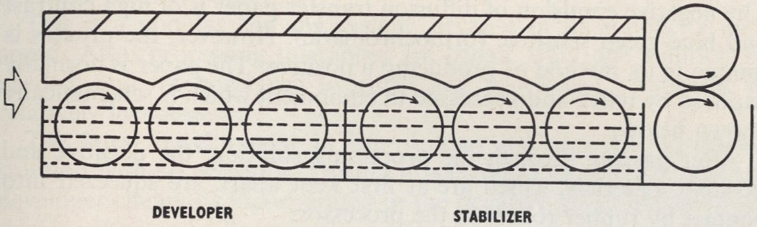

Lid of Printer
Original (writing side down)
Document Copying Paper (emulsion side down)
White Filter
Glass
Yellow Light
Light reflected by white paper
Light absorbed by Black Image
Yellow Exposing Light
Areas receiving light during exposure— no density on development
Areas not receiving light during exposure— heavy black density on development

Bi-reflex Copying Arrangement.

materials are automatically transported through the solutions, and emerge damp-dry at the delivery slot of the processor. The machines need no plumbing, no running water, and no special drying facilities.



Immersion Processing.



Dry Path Processing.

The chemistry used may be one of two sorts:

(1) Developer/Stabilizer Chemistry. In this the developer is contained in a tray in the processor. It deteriorates with exposure to air, irrespective of the amount of material passed through it, and has a limited life in the machine; usually about one week.

(2) Activator/Stabilizer Chemistry. This system can only be used with emulsions designed for it. The emulsions incorporate the developing agents themselves. When the activator is absorbed by this emulsion, it releases the developer chemicals which then develop the image in the paper.

The activator solution contained in the copier is inert to air, and thus has a much longer life in the copier.

The stabilizer used in both these systems takes the place of a normal fixer. It renders the material non-light sensitive, and makes the image "permanent," although this is a relative term. They will last for several years, providing that they have been allowed to dry before storing, and are not left in bright sunlight for long periods.

They can be made completely permanent, at any time, by fixing, washing, and drying in the usual way.

Automatic processors eliminate the handling of materials in chemicals, and mean that unskilled personnel may be used to produce copies.

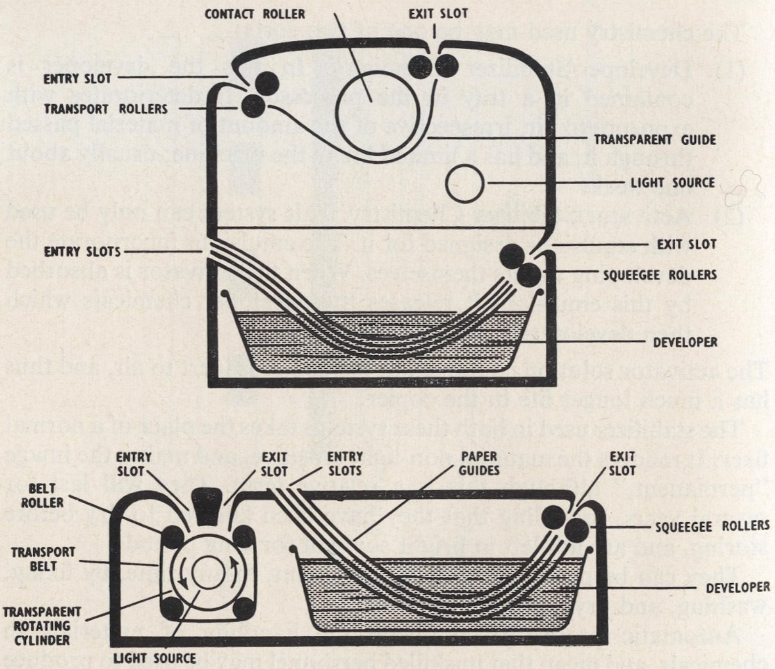
Most of the materials may be processed in conventional photographic developers and fixers, using open dishes placed in a sink. Running water is needed to wash the copies after they have been processed, and some means of drying the prints must be available.

They may be dried, either by placing them face up on sheets of *photographic* blotting paper (this is most important, since normal blotting may cause staining in the prints), or alternatively prints may be dried on butter muslin stretched over frames. A hot drum drier may be used.

Diffusion Transfer Materials

The negative emulsion of diffusion transfer paper is of high contrast and blue-green sensitive (orthochromatic). However, the process is unique in its method of producing a positive. The paper is normally exposed by reflex and processed in equipment which is schematically shown below.

After passing through the processing solution, the negative and positive materials, which are at first kept apart, are squeezed into contact by rubber rollers in the processor.



CONTACT ROLLER
EXIT SLOT
ENTRY SLOT
TRANSPORT ROLLERS
TRANSPARENT GUIDE
LIGHT SOURCE
ENTRY SLOTS
EXIT SLOT
SQUEEGEE ROLLERS
DEVELOPER
ENTRY SLOT
EXIT SLOT
ENTRY SLOTS
PAPER GUIDES
EXIT SLOT
BELT ROLLER
TRANSPORT BELT
TRANSPARENT ROTATING CYLINDER
LIGHT SOURCE
SQUEEGEE ROLLERS
DEVELOPER

Two Basic Types of Printer.

The positive material is not light sensitive. It has a thin layer of gelatine coated on to it which is usually impregnated with hypo (fixer) although this can be in the solution. In addition, other chemicals called "nucleating agents" are present. The fully exposed areas of the negative are developed to metallic silver, the other areas are not.

When the two papers are squeezed into contact, the undeveloped silver halide areas of the negative are dissolved by the hypo and diffuse across to the coating on the positive paper. Here the "nucleating agents" render them into a black silver image to form a positive copy which is visible when the negative paper has been stripped away from the positive paper.

This is a popular copying system, because of its simplicity and speed. Also, processing tolerances are broad, only one solution is needed, and the combined exposing and processing equipment is relatively inexpensive.

The latest development in this process replaces the developer solution with an activator. During processing, this solution acts on developer chemicals incorporated in the negative paper emulsion to develop the image. Because the developing agents are in the paper rather than the solution, aerial oxidation is virtually eliminated, and the life of the solution is dramatically increased.

A variety of positive materials is available, including single-sided, double-sided, light-weight for airmail purposes, multi-copy, translucent for diazo intermediates, and clear film for diazo and overhead projection use.

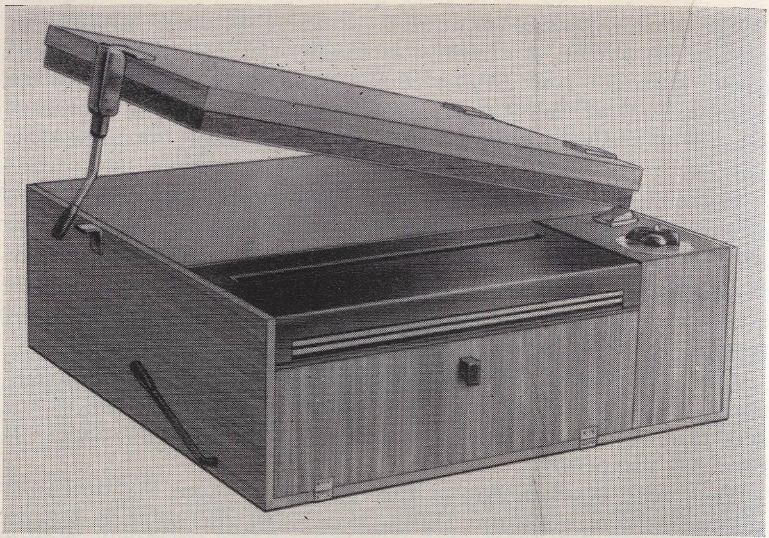
Activator solutions are, in modern machines, packed in plastic sachets, and the solution automatically drained back into these after use. In this way, the handling of chemicals is completely eliminated.

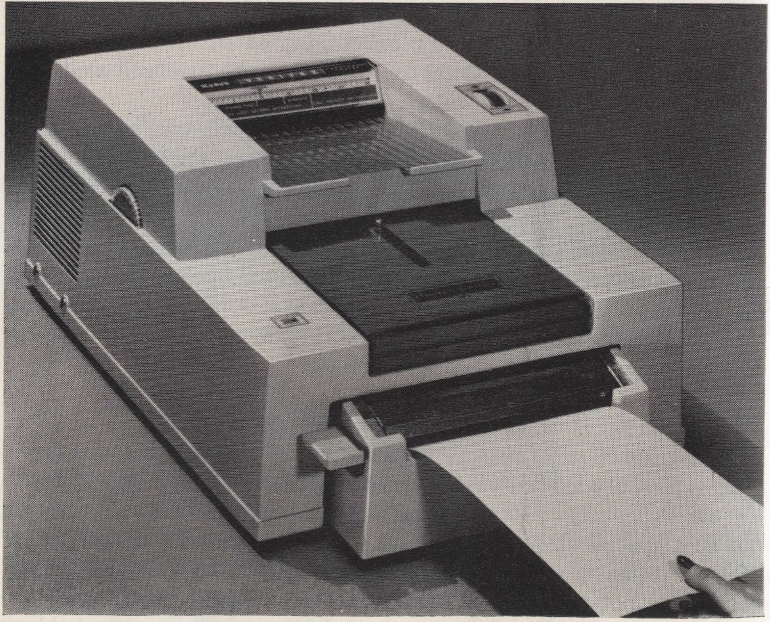
A similar process enables metal offset plates to be produced for printing on various small-offset machines.

Gelatine Transfer Process

The gelatine-transfer process is also unique in the way the positive copy is produced. The negative paper, called a matrix, is exposed with the original by the reflex method in the copier. Processing is carried out in a special activator solution. On processing the matrix, areas of the emulsion which have been exposed to light in the copier (*i.e.*, correspond to the background areas of the original) are developed and hardened, whilst unexposed areas are softened. A black dye is also formed which dyes both the soft and hard areas of gelatine.

By squeezing the negative in contact with a sheet of the positive paper, known as copy paper, a layer of the soft gelatine is transferred to this receiver, while the hardened gelatine remains in the matrix paper.





Diffusion Transfer Copier—Flat-bed.
Gelatine Transfer Copier—Rotary.

The copy paper is similar to ordinary bond paper and is non-light sensitive, although its surface is treated to give optimum image quality. With the appropriate materials it is possible to produce very quickly, several dry positive copies from one sheet of matrix paper, which are completely permanent. The equipment for producing them is simple to operate and inexpensive.

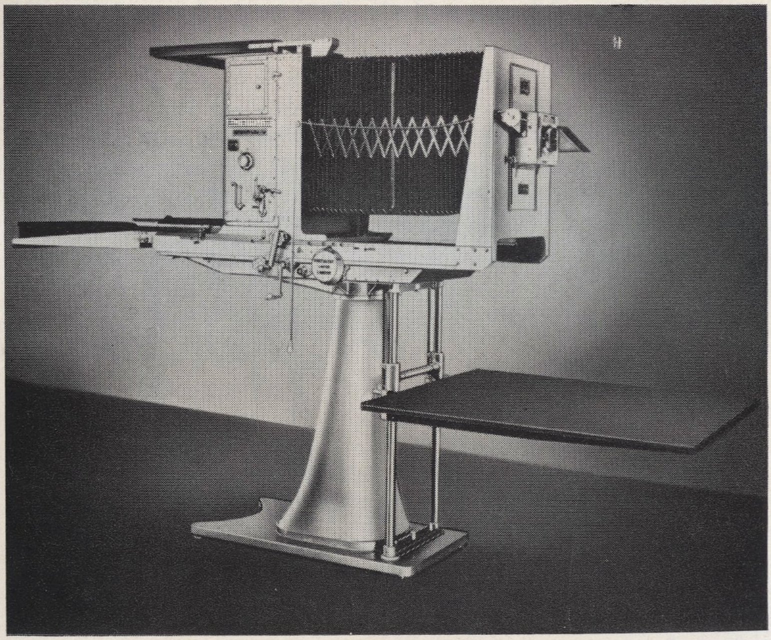
This process can also be applied to the making of paper offset masters for producing copies on a small-offset duplicator.

Optical Photocopying

The scope of contact copying is somewhat limited, especially when copies of continuous-tone and half-tone originals are required, when the size of the copy needs to be different from that of the original or when a coloured original has to be reproduced. Camera or optical photocopying equipment is available to cope with all these situations and although the process of optical copying is more time-consuming than contact copying, it is far more versatile.

Two stages are involved. First a negative has to be made using a camera, and then the negative has to be printed on to paper. In conventional photographic processes, the second stage is usually carried out in an enlarger, but using the special equipment available, this stage is simplified by using the camera to produce the positive print.

A copying camera such as that illustrated, can be used for reproducing all kinds of documents, commercial papers, maps, drawings



Semi-Automatic Copying Camera.

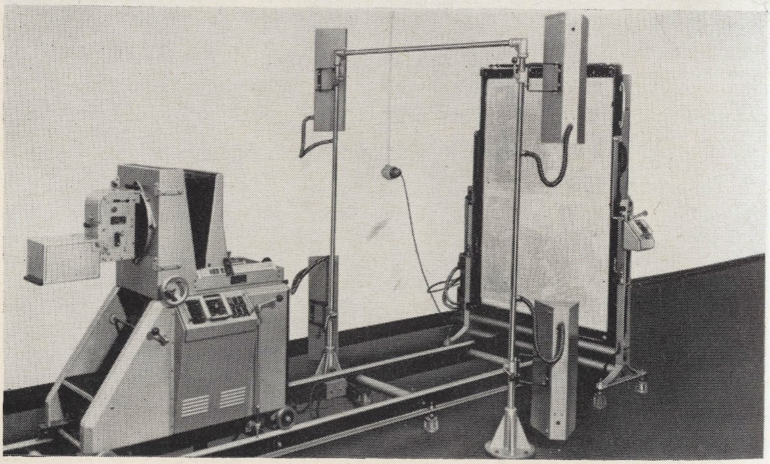
and even books. It is semi-automatic and incorporates a processing unit and so does not have to be used in a darkroom. The original is placed horizontally below the lens on the adjustable copyboard. It is evenly illuminated by two lamps, one on either side of the camera at an angle of 45° to the original. The camera is loaded with a large roll of special paper.

After exposure, the paper is automatically severed from the roll and passed into baths containing conventional developer and fixer solutions. The maximum size of the original that can be copied is 36 in. × 48 in. and the maximum copy size is 18 in. × 24 in. The first copy produced is a right-reading negative; subsequent copies can be made by simply rephotographing the negative copy.

With slight modifications this equipment may also be used to produce, in one step, plates for small offset-litho printing machines. These plates can be used to produce several thousand copies of the original, quickly and economically.

Using other equipment, drawings and other large documents of any size up to 40 in. × 60 in. can be reduced down to relatively small film negatives. Such negatives are convenient to store and are readily accessible. This is an advantage when only a limited amount of office space is available.

The original is put in the vacuum frame, which holds it completely flat. It can be illuminated from the front by placing two lamps on either side of the rail. Alternatively, if the original is translucent, it can be illuminated from behind the glass vacuum frame. The camera is moved along the rails until the image is of the required size. The film, which is in $4\frac{3}{8}$ in. × $6\frac{1}{2}$ in. sheets or 70 mm. rolls, is put in the back of the camera and the exposure made.



Camera for Reducing and Copying large Documents and Drawings.

The film can be machine-processed in special equipment which is a combined viewer, printer and processor. Alternatively conventional darkroom processing may be used.

The camera can easily be turned into an enlarger. A light source is attached to the back, the negative postioned in the camera between the light source and the lens, and the image projected onto the glass frame, which is loaded with printing paper. In this way the negative can be enlarged to the same size as the original or to any other size.

It is possible to remove imperfections and blemishes from a copy negative by retouching. This is usually carried out by a skilled technician or an artist.

5. Microfilming

This is the technique of making much reduced images of documents, drawings, etc., on 16 mm. or 35 mm. film.

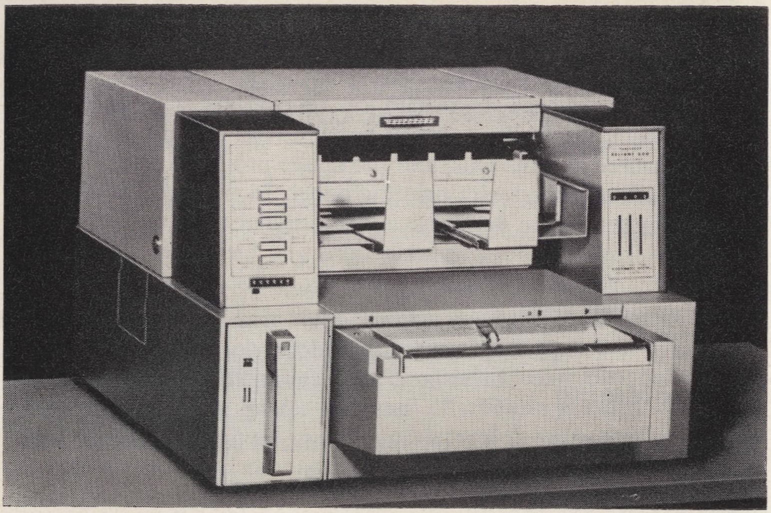
The process has become very widely used by organizations who wish to store many documents in as small a space as possible, and in a manner permitting ease of access to the file. In very many cases it has become an integral part of the office and accounting systems of the organization (as an example, some of the major Football Pool firms record all the millions of entries each week by this method). The equipment is specially designed to be simple to operate and, although the initial costs vary according to the complexity of the installation, running costs are extremely low.

Large-sized documents, engineering drawings, etc., are recorded on 35 mm. film, the narrower 16 mm. film being used for smaller sheet sizes, cheques, record cards, letters and so on. The films used are panchromatic and thus all colours in the documents are reproduced clearly on the black-and-white negatives.

The process consists of three main sections: photographing the documents, processing the films, and reading and/or reproducing the record.

Photography

The equipment for this purpose is called a microfilm camera. Microfilm cameras vary in their scale of reduction. For instance, a camera using a reduction ratio of 20 to 1 will enable 2,000 quarto-sized documents to be recorded on a 100 ft. roll of 16 mm. film. However, on a higher capacity recorder, having a reduction ratio of 45 to 1, over 16,000 such documents can be recorded on the same length of film. On some designs of cameras, the reduction ratio can be varied automatically. A simple switch change will adjust the camera to any one of a range of reductions from 45 to 1 down to 12 to 1. The advantages of this versatility are that sharp, detailed copies



Microfilm Camera that can expose in any of the three main ways.

of documents from a large engineering drawing down to small cards can be made without any complicated readjustments.

There are three main methods of microfilming.

Standard Microfilming: This employs the full width of the film and gives the lowest reduction ratio with the greatest degree of clarity.

Duo Microfilming: This uses one-half of the film width in recording a single side of the document. At the end of a run the film is reversed in the camera and the other half of the film is exposed. This gives a higher reduction ratio and is very suitable for large numbers of smaller documents.

Duplex Microfilming: This is a means of recording both sides of a document simultaneously. An optical arrangement photographs both sides of the sheet and the records appear side by side across the width of the film.

The size of the documents to be recorded, generally controls the rate at which the records can be made. Large sheets have to be copied on a flat-base machine and must be placed individually to be photographed, whereas smaller sheets can be copied on a rotary machine. They are placed in a feed hopper from whence they are taken automatically by a feed system, photographed, and ejected to a delivery hopper at rates up to 26,000 sheets per hour.

Other refinements which are available are:—

(1) Simultaneous microfilming on two rolls of film in cases where one copy is required for normal routine use, while the other is available for security, accounting or some other special use.

(2) A means of pre-indexing the documents by a system of code index lines on the film between the records.

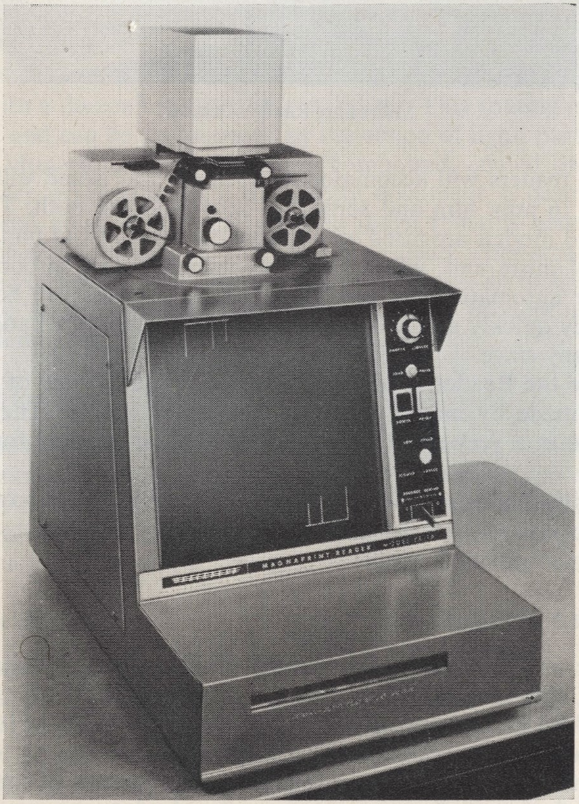
(3) A cancelling device which cancels or endorses documents after they have been recorded. This refinement can also be extended to count the sheets electronically.

Processing

In the majority of cases, the film is sent to the film manufacturer or to a commercial processing laboratory for processing. However, with large installations it is sometimes economic to include a film processing machine. There are modern, rapid, day-light processing machines suitable for this type of work.

Reading and Reproducing

In order to examine the processed record, the film is placed in a Reader which projects an image of the film on to a screen, which is large enough for the document to be read with ease and clarity.



Microfilm Reader.

Microfilm Reader/Printer.

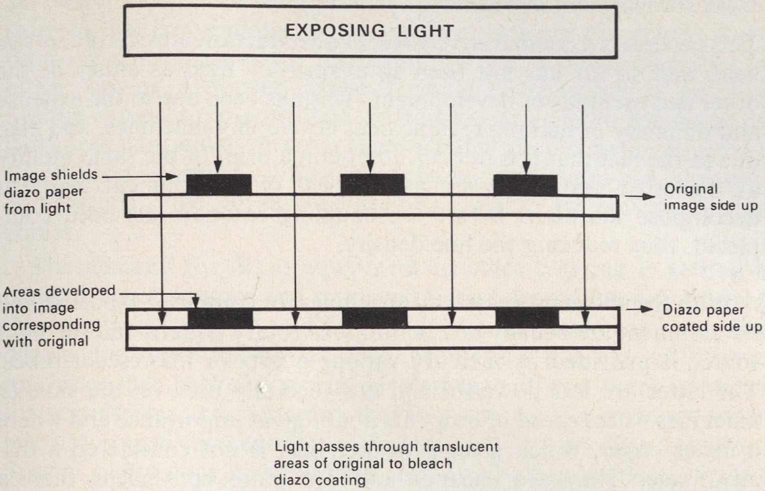
Some readers will accommodate 35 mm. film, some will accommodate 16 mm. film and some will accommodate both. The more advanced models are fitted with automatic loading and film advancing mechanism and, when these machines are used in conjunction with the automatic pre-indexing device, documents can be located extremely quickly and accurately without the operator handling the film at any stage.

Where the Reader is combined with a Printer, prints of a record can be made by merely pressing the printer button. The print is available in a very short time, and the Reader is ready for further use.

As with Recorders, Readers can be fitted with interchangeable lenses to give various magnifications. In addition, printing paper is available in different widths.

6. Diazo Processes

This process, sometimes described as the "dyeline" or "diazotype" process, although used for many years mainly in copying engineering and architectural drawings, has, since the War, found an important place in office copying. It has the great advantage of being the cheapest reproduction process for a restricted number of copies from each original—say from one up to one hundred or so.


EXPOSING LIGHT
Image shields diazo paper from light
Original image side up
Areas developed into image corresponding with original
Diazo paper coated side up
Light passes through translucent areas of original to bleach diazo coating

Diazo Copying Arrangement.

The process derives its name from the fact that the copy paper is coated with a diazonium salt and a stabilizer. This coating is yellow in colour and can be decomposed by the action of light, particularly the near ultra-violet. The diazonium compound, coated on a base paper, when exposed under a translucent document, is destroyed in the exposed areas, and undecomposed diazo remains beneath the opaque lines of the original. This remaining diazo, when treated with a coupling compound, will form an azo dye to give an image, which is positive to the original. This reaction can be brought about in three different ways.

Semi-dry Process

This is the most widely used for office documentation, as it combines convenience with good quality prints, and it uses a type of diazo paper having a good shelf life. The base paper is coated with a diazo compound and acid stabilizer, and development is brought about by applying a liquid developer, which contains the coupling compound.

Ammonia Process

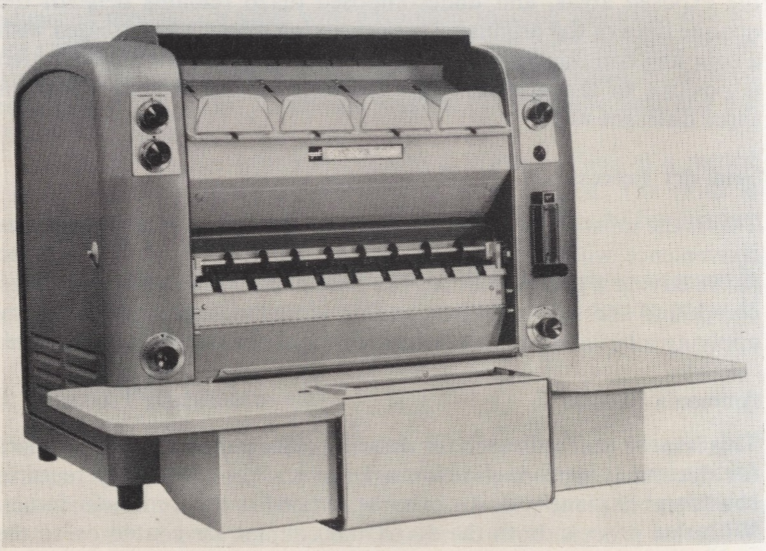
This is more generally used for drawing office purposes, and in offices for document reproduction on a large scale, as it usually requires considerable plant with an exhaust outlet for the ammonia fumes. With this process, both the diazo and coupler are coated on to the paper with stabilizer, which inhibits the coupling reaction until rendered alkaline by the action of the ammonia.

Heat Development Process

This process is a comparatively recent introduction into the diazotype field, and so far has not been so extensively used as either of the other two methods of development. This has been due to the expense and difficulty of making reliable heat developing machines, and also due to the fact that it is difficult to obtain a print of the same quality as the other two processes, as the heat of development tends to decompose the diazo before the coupling reaction has been completed, thus reducing the line density.

With the above processes, the machines for combined exposure and development are usually of a continuous rotary pattern and the light source is provided by mercury vapour quartz or fluorescent tubes. The latter are less powerful and are generally used on the smaller machines where speed of output is not of great importance and where a faster paper, which gives a weaker line, is not considered a disadvantage. They are cheaper and are more convenient than a mercury vapour tube in certain cases, as they do not require a warming-up time.

The only important limitation with the conventional diazo machines, however, is that the original document must be a translucent or transparent sheet, which must not be printed on both sides. The reason is that in ordinary diazo copying ultra-violet light must pass through the original before striking the sensitized paper. It is,



Ammonia Process Diazo Printer.
Manually Sheet fed or Automatically Roll fed with synchro-cutting knife.

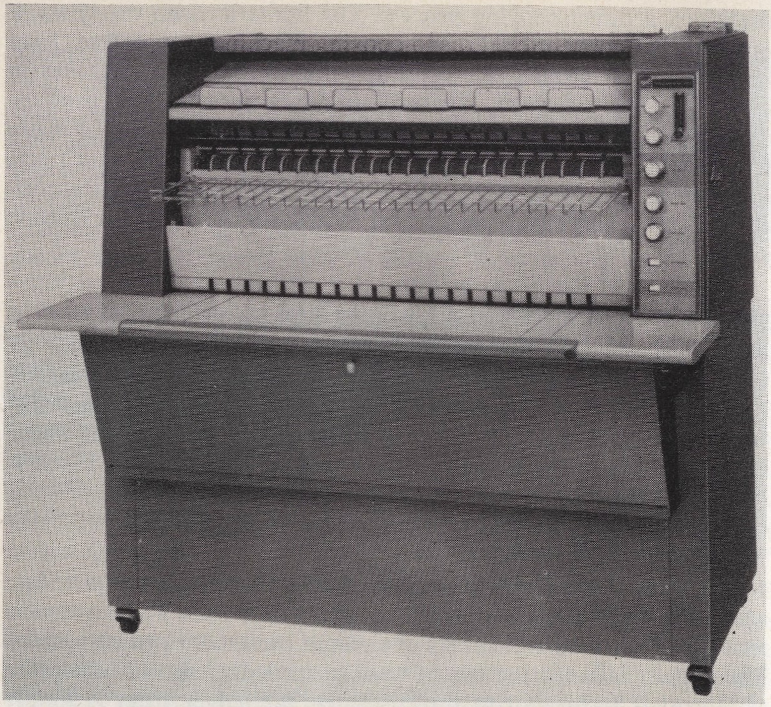
therefore, a direct copying process. The limitations on the types of original that conventional diazo copying machines can accept, have been the chief reasons for restricting the use of these machines in office copying. However, where it would be economic to produce dyeline copies, an intermediate on translucent material can be made from opaque originals on other types of reflex photocopying machines, *e.g.*, direct positive, diffusion, gelatine and infra-red transfer, electrostatic. This can then be used as a master for making dyeline copies.

The demand for diazo equipment in office copying is getting a marked boost as more and more companies are deliberately placing their business forms on translucent paper, so that they can be readily copied by these machines. Also promoting the use of dyeline machines, has been the recent development of new types of paper for office forms and stationery that look almost like ordinary paper but are translucent enough to be handled by the diazo process. Special photo-copying typewriter and accounting machine ribbons and carbons can be obtained, which enable a denser image to be obtained on dyeline copies.

The uses of the diazo process for office documentation purposes are many and varied. Among the most widely used applications is that of despatching statements of account each month to customers. The system calls for the use of translucent ledger sheets. When the statement is to be sent to the customer, the ledger sheet is simply taken from the folder and fed into a dyeline machine. The copy produced is sent as the statement, which is produced at minimum cost and without any need for checking, as it is an exact copy of the customer's account, showing all the relevant transactions.

Production control is another application where the process finds a place, because the co-ordination and control of all functions associated with the processing of raw material calls for a considerable number of documents. Such aspects as planning, progress, rate-fixing, etc., can be assisted by the installation of a dyeline system, thus reducing costs and the chance of error. Where copies of documents such as invoices, requisition slips, etc., are to go to different departments, they can be produced on different coloured paper as desired, or even on card for stock control; translucent copies can also be made on reproduction tracing paper or film, from which subsequent copies can be taken. This has the advantage that data can be added to the translucent copy (then called an intermediate) and then further prints can be taken from it. Another application is in the field of export documentation.

Diazo copies are, for the majority of purposes, considered permanent, although if exposed to light for a long time some discolouration of the background will take place.



Ammonia Process Diazo Printer for Large Size Sheets.

7. Heat Processes

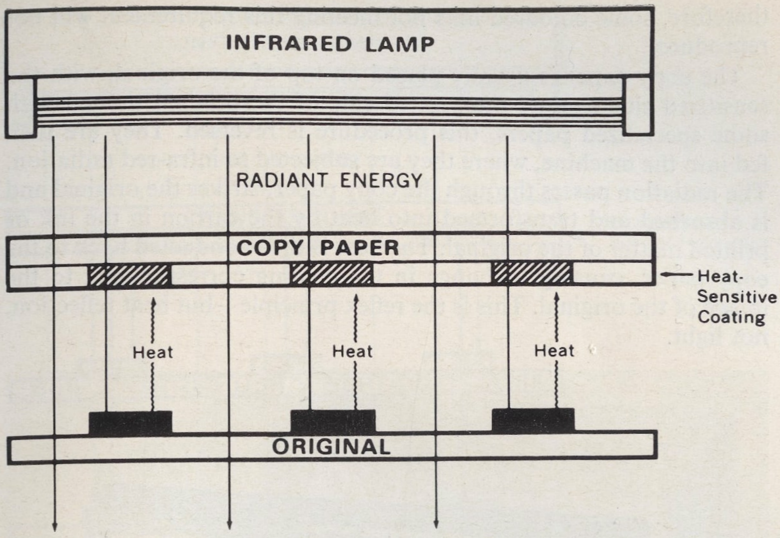
Under this heading are processes which in one way or another employ heat—principally in the form of infra-red radiation—and its reaction on chemicals in order to produce a copy.

Infra-red Direct

Also known as the "thermographic" process, this method is based upon the principle that dark substances tend to absorb more radiant energy than light coloured substances. In absorbing this energy dark substances generate heat. The heat, beyond a certain temperature will, if radiated on to a specially prepared heat sensitive paper, effectively turn it black.

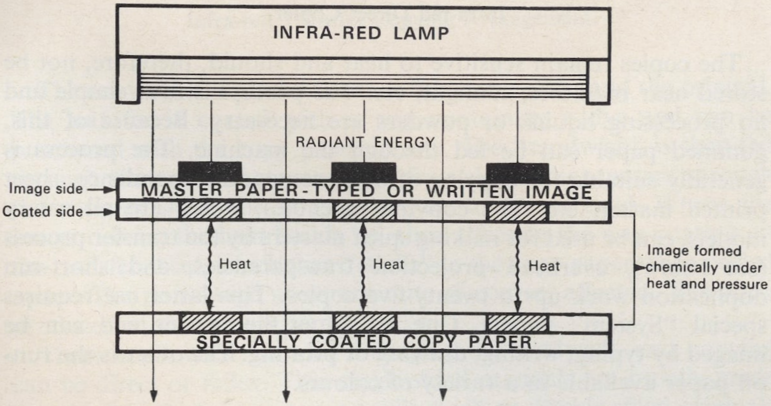
There are several ways of producing a visible image by heat and a variety of specially prepared papers is available. The basic process employs a copy paper which is coated with ferric compounds and acids and uses infra-red radiation as the source of radiant energy.

The original can be opaque, translucent, single or double-sided. However, the image on the original, must be produced by inks based on carbon or a metallic substance which will absorb or radiate heat,


INFRARED LAMP
RADIANT ENERGY
COPY PAPER
Heat-Sensitive Coating
Heat
Heat
Heat
ORIGINAL

Heat generated in the infrared-absorbing image area of the original is conducted to the heat-sensitive paper, forming a colored compound in the image areas.

Infra-red Direct Copying Arrangement.

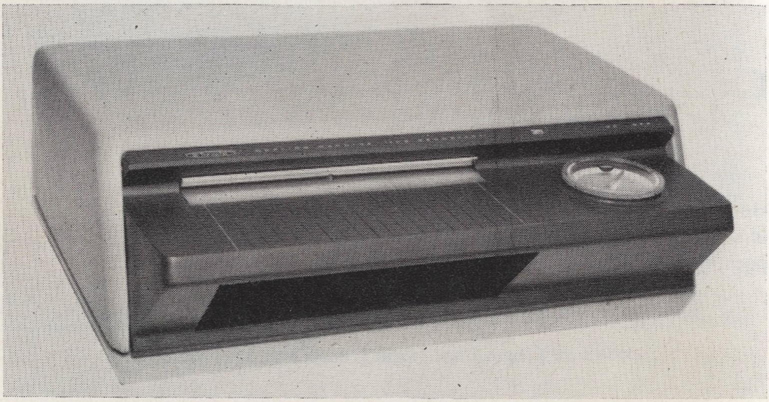

INFRA-RED LAMP
RADIANT ENERGY
Image side
Coated side
MASTER PAPER-TYPED OR WRITTEN IMAGE
Heat
Heat
Heat
Image formed chemically under heat and pressure
SPECIALLY COATED COPY PAPER

Heat generated in the image area of the master sheet reacts in the image area on the reverse side.—This in turn interacts with the image area on the coating of the copy paper.

Infra-red Direct Copying using special Systems Papers.

therefore, some coloured inks not meeting this requirement will not reproduce.

The copy paper is usually placed on top of the original, with the sensitized side against the printed side of the original though with some specialized papers, this procedure is reversed. They are then fed into the machine, where they are subjected to infra-red radiation. The radiation passes through the copy paper, strikes the original and is absorbed and transformed into heat by the carbon in the ink or printed matter of the original. The heat is then conducted back to the copy paper, causing a change in the coating corresponding to the image of the original. This is the reflex principle—but heat reflection, not light.

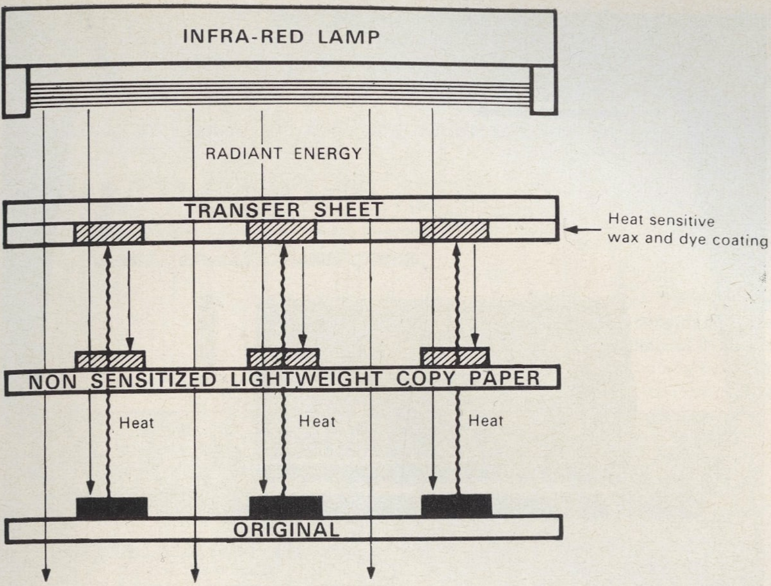


Infra-red Direct Copier.

The copies remain sensitive to heat and should, therefore, not be stored near radiators, sunlight, etc. The process is fast, simple and no processing liquids or powders are necessary. Because of this, gummed paper can be fed through the machine. The process is generally suitable for copying of documents, correspondence, sheet printed matter, etc. The copying machines, which are all rotary models, can be used for making spirit masters by the transfer process (see below), overhead projection transparencies, and short-run duplication work up to twenty-five copies. This latter use requires special "System" papers. One serves as the master and can be imaged by typing, writing, drawing or printing. The other is the run-off paper available in a variety of colours.

Infra-red Transfer

This process requires ordinary unsensitized paper—but still uses the ability of black or metallic ink to heat up quickly, as in the previous method. Similarly there is difficulty with certain non-metallic colours.


INFRA-RED LAMP
RADIANT ENERGY
TRANSFER SHEET
Heat sensitive wax and dye coating
NON SENSITIZED LIGHTWEIGHT COPY PAPER
Heat
Heat
Heat
ORIGINAL

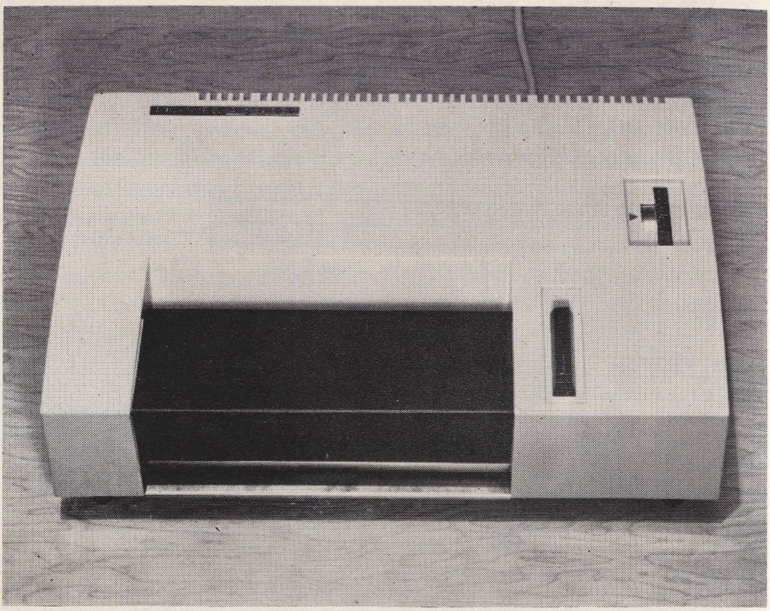
Normal arrangement of the "sandwich"!
The heat generated in the infra-red absorbing
image area of the original, is conducted to the heat
sensitive wax, which then adheres to the non sensitized
copy paper

Infra-red Transfer Copying Arrangement.

The copy sheet is placed between a transfer sheet and the original. The transfer is coated with a wax containing a dye and can be purchased with the copy paper in sets. The "sandwich" is then fed through the transfer copier and infra-red radiation passes through the transfer sheet and copy paper on to the original. Where the image occurs, the heat builds up, thus affecting the wax coating on the transfer sheet, which then "sticks" to the copy paper when peeled apart. The non-image areas are not, of course, affected. The copy produced in this way is permanent.

There are several ways of arranging the sandwich, and copying can be direct or reflex. Thin single-sided originals are usually made direct on to thick copy paper, while thick or double-sided originals are made by reflex on to thin copy paper. Transfer sheets may be paper or plastic based, the latter producing better copies.

One-time transfer sheets are only suitable for single copies although if the image is placed against an untouched part of the transfer, it is possible to obtain a further copy. Transfer sheets are



Infra-red Transfer Copier.

available however, which produce up to six copies, even if the image overlaps.

Copiers can be rotary or flat-bed. The most common applications in order of importance are for producing spirit masters, overhead projection transparencies, statement copies, address labels and laminating. They are also used for making offset masters but for this purpose are not entirely satisfactory. Diazo masters can be made by transfer on to a translucent paper.

Dual Spectrum Process

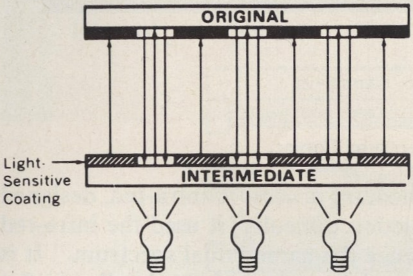
This method uses visible light exposures and infra-red heat for development, and employs an intermediate sheet to transfer the image from an original to the copy paper. It cannot use materials employed with other heat processes.

The special intermediate sheet is coated with light sensitive materials which decompose when light is reflected from the white non-image areas of the original. The invisible, partially undecomposed areas correspond to the printed images on the original.

This intermediate is exposed by reflex with the original to an intense light. The coated side is placed against the original. When fed through the copier, the light passes through the intermediate to the original, is absorbed by the image areas and reflected back to the intermediate sheet from the non-image areas. Thus the sensitized coating is decomposed everywhere except in the dark image areas.

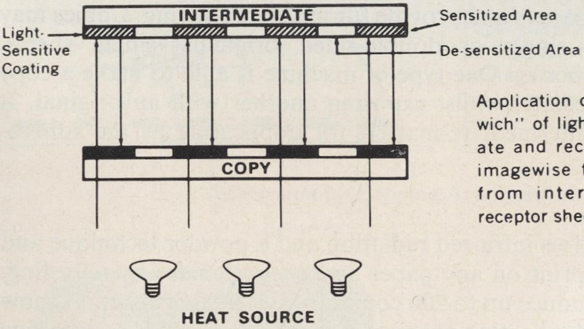
The intermediate sheet is now a reversed image of the original, like a photographic negative. To develop the latent image, it is placed face to face (coated sides) with a special copy paper. The latter serves as the final positive copy and has a coating that, when heated, reacts with the chemicals left on the latent image areas of the intermediate.

I. EXPOSURE (Visible Light)



The light-sensitive coating is destroyed by the visible light in the areas corresponding to the non-printed areas of the original, from which it was reflected. The coating remains in the image areas.

II. DEVELOPMENT (Heat)



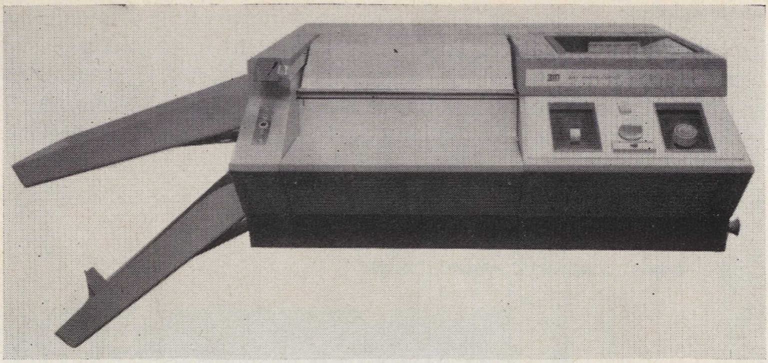
Application of heat to the "sandwich" of light-exposed intermediate and receptor sheet causes imagewise transfer of reactant from intermediate sheet to receptor sheet.

Dual Spectrum Copying Arrangement.

The intermediate together with the sheet of special copy paper, is fed into the infra-red unit which radiates through the intermediate on to the copy paper. A chemical reaction takes place between the undecomposed compound in the image area of the intermediate and the coating on the copy sheet, thus forming the image.

The temperature to which the sheet is heated determines how long development will take—but given a certain temperature all copies will require the same development time. Accordingly the temperature time relationship determines the extent of the image development.

The result is a good quality permanent copy. The process reproduces most colours, but not to the standard of photographic processes when half-tones are involved.



Dual Spectrum Copier.

Although originally a supplementary process to infra-red, designed to overcome the colour reproduction difficulty, it used the infra-red copier to develop the image—hence the name "dual spectrum." It is now a copying process in its own right, using a heated roller or flat plate instead of the infra-red lamp.

The copiers are flat bed and some machines use a continuous roll of intermediate papers and provide for multiple copying. Copies may be taken from single or double-sided originals—single sheets, magazines, and books. One type of machine is able to make a copy from an intermediate, whilst exposing another with an original. It can also make intermediate masters for duplicating by the adherography process.

Adherography

This process utilizes infra-red radiation and a powder technique and produces black print on any paper and on both sides by refeeding. Since it can reproduce up to 200 copies from a single master it is now more akin to a duplicating process. It is included in this section due to its close affinity with other heat processes.

The special master, which is imaged on one side with a carbon or metallic ink, for infra-red absorption, has a chemical coating on the reverse side. When this has been fastened to the cylinder of the machine—coated side outwards—the cylinder rotates past an infra-red radiation source, simultaneously in contact with an ordinary sheet of bond paper. The radiation is converted to heat by the black areas of the master and this causes a quantity of chemical, corresponding to the image, to soften, which is then transferred to the copy paper.

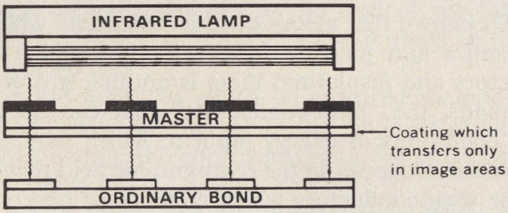
The latent image is now developed by passing it through a unit where a black powder is cascaded over it. This sticks to the transferred substance, surplus powder is shaken off and the image heat fused to produce a dry permanent copy.

I. Master which is treated with adherography material is created

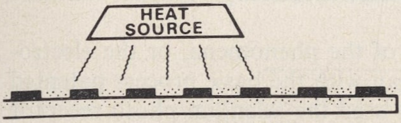
A. Direct master—Infrared-absorbing image is produced by printing, drawing, writing.

B. Facsimile intermediate—Infrared-absorbing image is produced from existing material of any colour by utilizing the Dual Spectrum Process in exposing and developing.

II. Transfer of image from master to ordinary bond paper by infrared radiation

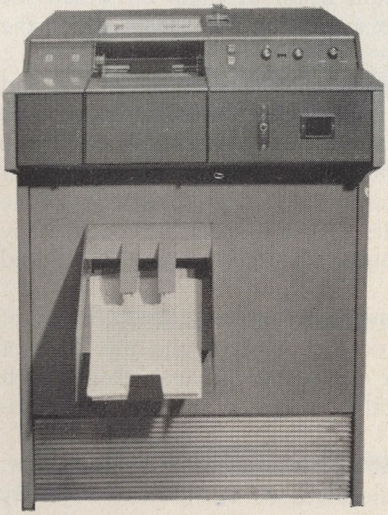

INFRARED LAMP
MASTER
Coating which transfers only in image areas
ORDINARY BOND

III. Powder development of image


HEAT SOURCE

Paper passes through a trough containing a toner powder, which adheres in areas to which coating from back side of master has been transferred. Powder is fused to image area by heat.

Adherography Copying Arrangement.



Adherography Copier used to make copies from Masters made on the Dual Spectrum Copier.

Two types of masters can be used. Firstly a DIRECT master, produced by printing, writing or drawing an image with a substance that absorbs infra-red radiation. Secondly a FACSIMILE intermediate produced from the original by utilizing the Dual Spectrum process. Since the latter is colour sensitive it reproduces from most colours.

The machines are of a rotary pattern and once the master is fixed, completely automatic, producing up to forty copies a minute.

8. Electrostatic Processes

It is well known that metals conduct electricity whilst materials such as ceramics and plastics do not. Between these two groups (the conductors and insulators) there is another group of elements and compounds, the "semi-conductors" that can do either, according to the conditions or energy input to which they are subjected. All electrostatic processes in the reprographic field rely on the properties of these semi-conductors which conduct or otherwise according to the light energy or light and shade to which they are subjected. These "photo-conductors" include sulphur compounds, selenium, zinc oxide and some organic compounds. A surface coated with one of these materials for use on an electrostatic-reprographic machine is referred to as a photo receptor.

The history of the application of the phenomena, or the electrostatic process of reprography began with the basic process patented by Chester Carlson in 1939. This used the selenium photo receptor surface on which the image was formed, "inked" with a dry powder ink adhering electrostatically, and printed-out onto ordinary paper or other unsensitized material. This is sometimes called the "indirect electrostatic process." The selenium drum or plate on which the image is formed becomes in effect a printing plate from which the image is printed out.

Derivatives of this basic process have since been developed and these involve the use of specially coated papers which thus become the photo-receptors. These variations are sometimes called the "direct electrostatic process" as the image is formed directly on to the sensitized coated copy paper and developed by application of the charged powder. The requirements to use a specially coated copy paper rather than ordinary and unsensitized copy material imposed some limitations in usage.

The term "xerography" was invented following development of the initial patent to describe all processes involving the utilization of the photo-conductive medium for electrostatic images. Hence both "direct" and "indirect" electrostatic processes are properly xerographic systems.

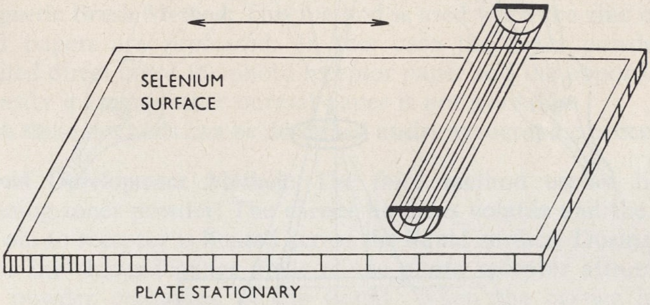
The methods used, however, are, from the scientific point of view, similar. Each uses known scientific methods in different ways. By studying the original basic process the variances used by the processes derived from it can be noted in passing.

The xerographic system incorporates the following major components:—

(1) A photo receptor surface.
(2) A means of electrostatically sensitizing the photo receptor surface.
(3) A means of imaging an original on to the sensitized photo receptor.
(4) A means of either "inking" the resulting charge pattern with an oppositely charged dry ink in the case of the "indirect process"; or a means of developing a latent image in the case of the "direct process."
(5) A means of printing out on to unsensitized material, *e.g.*, ordinary bond paper in the case of the "indirect process."
(6) A means of bonding the copied image to the material on to which it is copied.

The diagrams which follow show how these ingredients are put together as a process. First the photo sensitizing of the photoreceptor by subjecting it to an electrostatic charge.

MANUAL OPERATION—CHARGING BAR MOVES.



AUTOMATED XEROGRAPHY—DRUM MOVES.

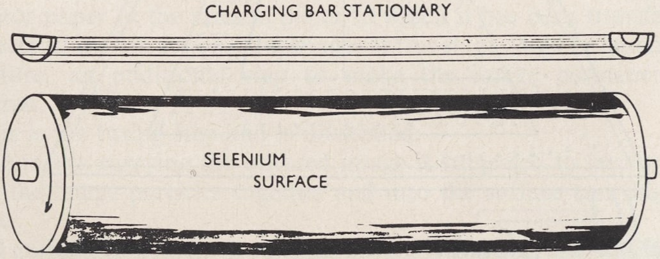
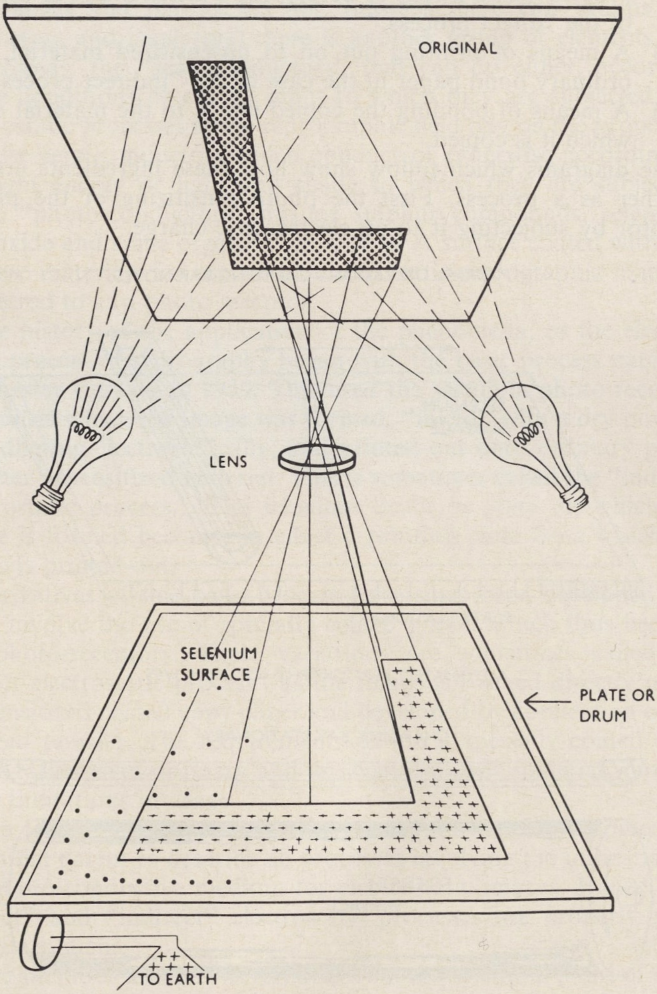


Photo-Sensitizing with Static Electricity.

The charging bar either moves across the surface of the photo receptor or, in the case of automated machines the photo receptor moves in relation to the charging bar.

The static charge generated by the charging bar is transferred to the photo receptor through the atmosphere and induces a positive or negative charge according to the design of the machine. In its charged condition the photo receptor must be kept in the dark if the charge is to be retained for the next step. This part of the process is common to both types of machine—those which use selenium and those which use zinc oxide as the photo receptor surface.

The creation of the image is shown diagramatically.



Selective Discharge by Light.

The original is suitably illuminated. The white areas reflect the light through the lens on to the photo receptor. The dark areas of the original absorb the light and through the lens cast a shadow of the original image areas on the photo receptor.

The reflected light from the original causes the semi-conductor in the photo receptor to change its state from a non-conductive medium to a state of conductivity. The static electricity in these areas leaks away. The static charge in the image areas because these areas have not been changed into a conductive state, retains a static charge. The latent electrostatic image thus created on the photo receptor needs to be kept in the dark until resolved into a visible image by the application of a dry powdered ink.

There are three methods of resolving the latent image. The choice of method is conditioned by the choice of photo receptor, machine design and whether the machine is to process normal office stationery or specially coated paper.

Mechanical Cascade Method: This is a popular and widely used method. The developer powder is literally cascaded over the surface of the photo receptor and the image creating powder, called toner adheres to the photo receptor in the image areas. This can be transferred subsequently to the normal office stationery.

Magnetic Brush Method: This method is used when the zinc oxide coated papers are processed. In this case the toner powder is deposited direct on to the photo receptor paper and the opportunity to transfer it to any other normal paper is not available.

Both these methods can be described as dry xerographic processes.

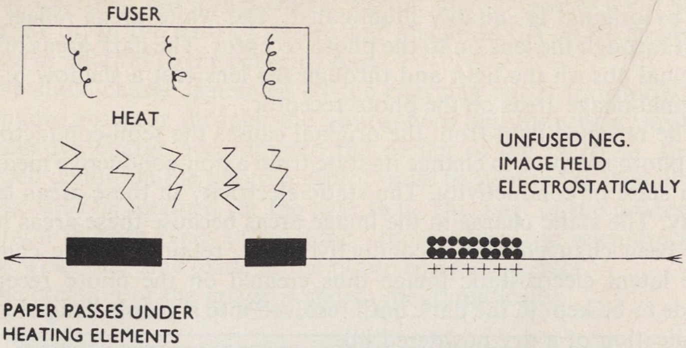
Liquid Development Method: The third method uses a liquid containing toner powder. The carrier liquid is volatile and the zinc oxide photo receptor is floated across the liquid surface. During this process the charged image areas of the photo receptor attract the toner powder contained in the liquid. When the carrier liquid evaporates the toner settles onto the surface of the paper.

In the case of the first two methods described above it will be noted that the image created by these methods is only holding to the photo receptor paper or the normal paper to which it has been transferred by electrostatic attraction. The images at this stage could be smudged, therefore, an additional step to make the image permanent is required.

This is the fusing step and is illustrated.

The media carrying the unfused image is subjected to heat which fuses the image particles together and into the surface carrying the image.

All automated copiers producing size for size copies use heat in one form or another. The methods include radiant heat similar to that



Fuser Fixing.

given off in domestic electric fires or in the more modern machines by means of a heated pressure roller.

The xerographic systems has many applications. Reduction and enlargement facilities can be built into the machines using the process. Solid objects can be "xerographed," microfilm can be printed on to unsensitized paper or offset master material and masters created for the diazo process on translucent materials from opaque originals. Strip index panels can be used as originals on some machines. Templates for masking, registration, substitution, shingling, titling and the selection of a few items from a list of many items can be done and these templates are used in system applications. The templates are used to reduce or eliminate the need for retranscription and in order to change one document into another. For example: Bills of Lading can be changed into Cargo and Freight Manifests, Ledger Cards can be changed into Statements and Purchase Requisitions into Suppliers' Orders and Goods Inwards Advices, and so on.

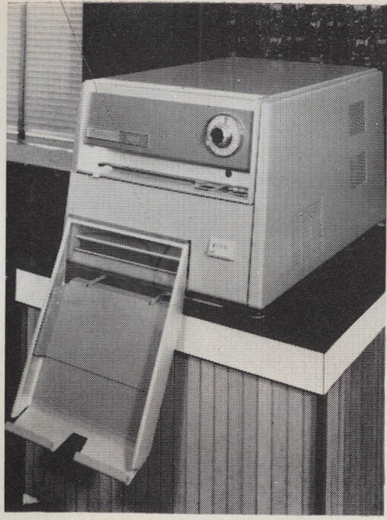
Some copying machines when used for systems work have to be associated with offset duplicators or printers, others do the whole job in one unit. It is only machine design and the choice of the photoreceptor that either restricts or enhances the machine's application capabilities.

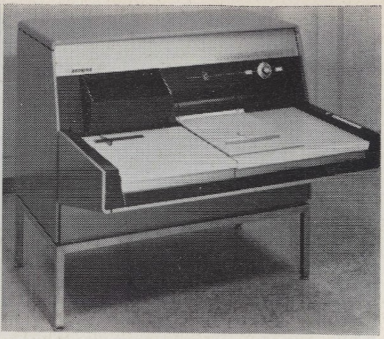
By and large the machines using the two major applications of xerography can be grouped as follows:—

(1) Copiers working at a rated maximum speed of about 420 per hour.

(2) Copier/duplicators which operate at rated speeds ranging from about 720 to 3,600 copies per hour.

When changing the original frequently for short-run work, the hourly output is reduced by the time it takes the operator to pick up one original and replace it with another.





Above: Electrostatic Copier (Zinc Oxide).

Left: Electrostatic Desk Top Copier (Selenium).

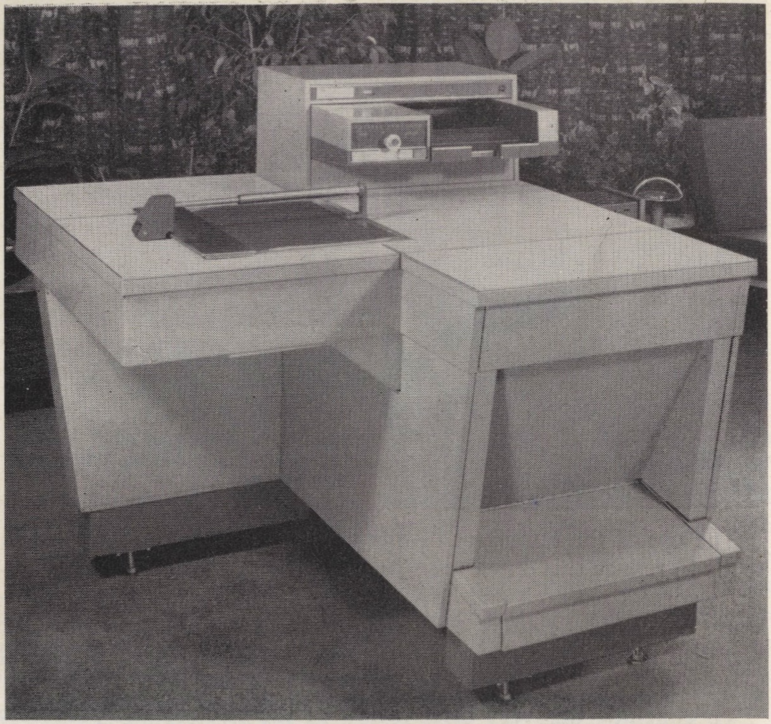
The use of the templates of one type or another, already noted, tends to reduce this down time, and so increase productivity.

As current research and developments becomes manifest in hardware, copier/duplicator speeds can be expected to increase without recourse to specially created intermediates for the offset or stencil processes.

To conclude this very brief review of the electrostatic processes passing mention should be made of the use of organic photo receptors. Kalle of Germany who were engaged in the diazo process could see the potentialities of electrostatics. They directed their scientists to find an alternative to both zinc oxide and selenium since both these processes were well established at the time.

These scientists discovered a vegetable compound that would selectively discharge in conditions of light and shade to which it was exposed once charged with static electricity. It is xerography by another name. The characteristics of the organic photo receptor, however, make it a wet process. After the image has been formed electrostatically and fused, the finished product needs to be immersed in an alcohol/alkali solution and then washed in running water. In this case the support for the photo receptor is a metal plate, It is therefore restricted to producing high grade offset metal plates. for long-run duplicating and printing. It does not compete in the same market as do the other xerography processes.

The use of sulphur compounds has been mentioned. No doubt one or more will be produced in due time. In the electrostatic section of the relatively new Reprographic industry innovation is inevitable. New machines will come, others have already gone, but xerography and its related processes seem to have a limitless future.



Electrostatic Copier (Selenium).

9. Spirit Duplicating

This method of duplicating is used mainly for short work, the range of copies being from 1 to 500. It is extremely simple and little training is necessary to carry out the process. The master can be prepared in several ways, but all involve the use of an aniline dye in the coating which is the transfer medium, and a solvent containing commercial alcohol as a base to damp the copy paper. A particular advantage of the method is that multi-colour work is possible in one operation. The master is clipped to the drum of the machine. Copy paper, which should also have a smooth glazed surface, is fed into the machine and damped by either a felt pad or a roller moistener. It then comes into contact with the master under a pressure roller. The fluid dissolves a minute quantity of the dye and so produces the copy.

Masters

The master is the foundation of good spirit duplicating and, is an art or chromo paper. This has a glazed or shiny surface on one side, to withstand repeated contact with the damp copy paper, and which receives the transfer image.

The transfer medium, usually hectographic carbon paper, should have the following characteristics for good reproduction.

(1) It should be clean and easy to handle.
(2) The coating should be uniform.
(3) The dye should transfer to the master evenly and cleanly.
(4) The dye should transfer easily, when in contact with the damp copy paper under pressure.

Typing or written errors may be corrected in the following manner.

A single character is isolated with an erasing shield, and then carefully erased with a suitable eraser. Erasing continues until both smudge and error disappear. A piece of hecto sheet is then placed over the error, and the correction retyped by striking characters two or three times.

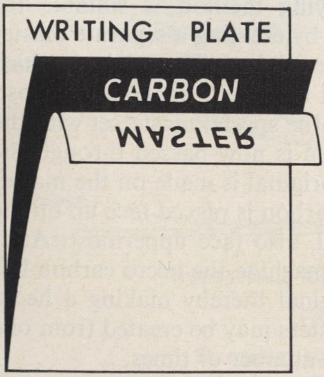
Smudge may be prevented by using a sharp knife to remove excess dye, then finished with an eraser. Care should be taken not to damage the surface of the master. Should erasures break into the surface of the master paper it is advisable, before typing in the correction, to rub over the roughened surface with a white china clay pencil. This provides a smooth protective film and will prevent the carbon deposit made when copying the correction from "bleeding" into the master paper.

Corrected words are typed either in the margin of the master or on a separate master. The error is then cut out on original master, and the correction is cut out to same size. The correction is fixed firmly into position with self adhesive paper on the reverse side.

Another method of erasing, is by the use of a special spirit correcting fluid, which is painted over the error. This is a solvent metallic fluid. It dries rapidly and the correction is then typed or written.

The preparation of the master can be effected by hand or machine in the following ways:—

Handwritten: A good quality hectograph carbon is necessary. The coated side is placed against the shiny surface of the master paper.



Master Assembly for Spirit Duplicating.

The writing or drawing of the copy is made on the dull side of the master, thus a reverse or mirror image is produced on the shiny side of the master. Pencil, ball pen or stylo can be used, but it is advisable to use a writing plate to give a hard smooth foundation.

Where a number of different colours are required, it is only necessary to replace the hecto sheet with the colour desired and continue writing or drawing that part of the image which is required in the particular colour. When the image is complete and the hecto sheet removed, the transferred reversed image will be seen on the glazed side of the master. It is from this deposit, in conjunction with the solvent medium that the reproduction is ultimately obtained.

Typewritten: This is prepared in exactly the same way. However, since typewriter platens vary appreciably, the master should be typed against a suitable backing sheet. For fine detail short-run work, it is better to type without the typewriter ribbon, but where maximum length of run is needed it is better to type through the ribbon because this transfers a greater deposit to the surface of the master, but detail will be a little less sharp. Special typewriters are available that dispense with the handling of hecto carbon in sheet form and use instead hecto carbon paper ribbons. This method saves valuable time where masters are continually being produced.

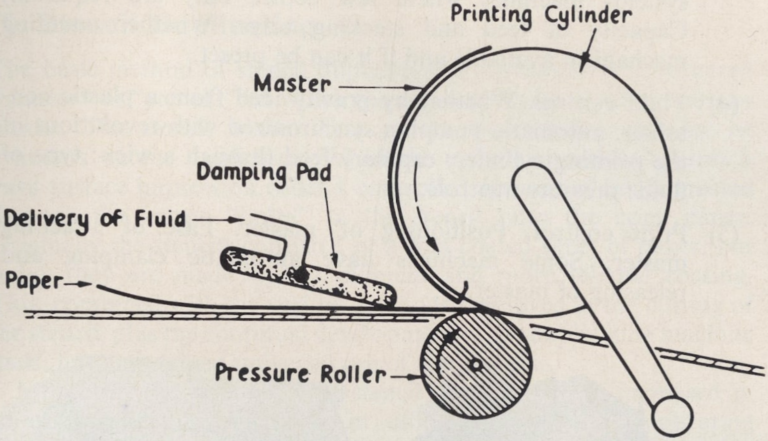
Masters can be prepared on tabulating machines, by using a roll of hectographic carbon behind the paper when it is being fed into the machine. When the machine prints, it automatically produces the master which can be used for other purposes. Similarly the teleprinter can also produce masters of its messages in the same way.

Printed: The art paper and hecto sheet can be put through a printing machine to produce a preprinted master. This is most useful where permanent matter is to be reproduced. Additional details can be added by hand or typewriter.

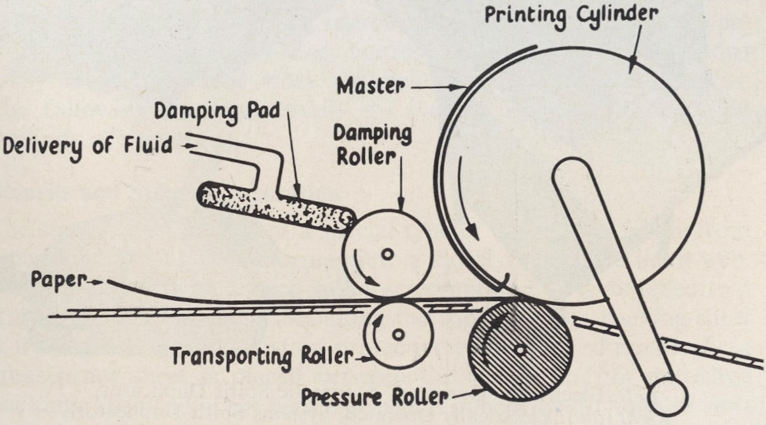
Infra-red Transfer: This photocopying method is suitable for creating a master in ten seconds either by creating a separate master using the original or by carbonising the original. The original, which may be typed, drawn or hand written is placed, image uppermost, in the carrier screen and on this is put the special masterset with the master paper on top. The closed screen is now passed through the heatcopier and a hecto master of the original is made on the master paper. To carbonize the original, the carbon is placed face up on the carrier screen and on this the original, also face uppermost. After passing the closed screen through the machine the hecto carbon has transferred on to the rear of the original thereby making a hecto master of it. Any number of hecto masters may be created from one original which may be carbonized any number of times.

Machines

The length of run depends upon the grade of hectograph carbon used and from the description of the process it will have been seen that it depends upon four components—carbon, master, spirit and run-off paper. By using in sequence several different colours of hectograph carbons when preparing the master, multi-coloured copies can be made in one run. Control of print quality when running, is by varying the amount of spirit and the degree of pressure applied by the impression roller. The damping of the "run-off" paper is either by metal roller, which is moistened from a felt pad, or direct from the felt pad on to the paper. Various controls of the fluids are used and there is one type of machine which obviates the use of fluid by using a specially impregnated "run-off" paper.


Printing Cylinder
Master
Damping Pad
Delivery of Fluid
Paper
Pressure Roller

Damping Direct to Paper.


Printing Cylinder
Master
Damping Pad
Damping Roller
Delivery of Fluid
Paper
Transporting Roller
Pressure Roller

Damping Paper via Damping Roller.

The machines may be small portable or floor standing models reasonably priced, or of more advanced design costing several hundred pounds. For ordinary duplicating purposes, the choice and price will depend on the following features.

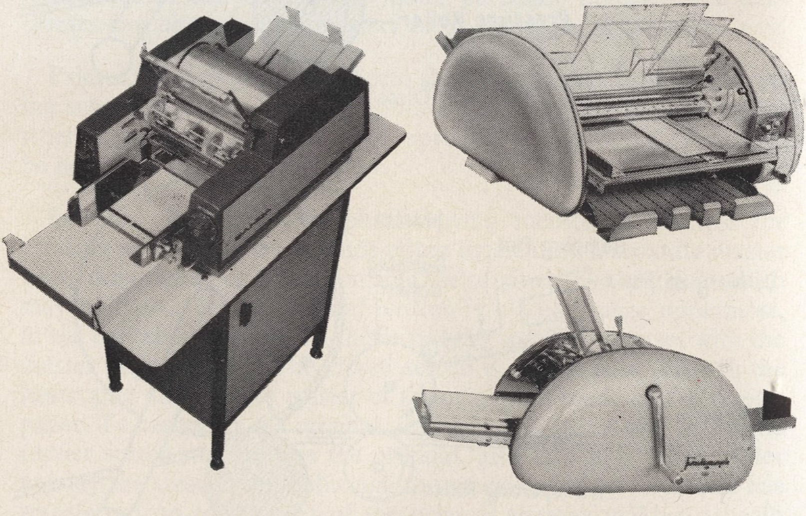
(1) Power. Whether hand operated or electrically driven; speed and ease of operation is the advantage of power drive.

(2) Size of paper. Standard foolscap machines have a maximum copy size of $9\frac{3}{4}$ in. × $15\frac{5}{8}$ in., brief models $17\frac{3}{4}$ in. × $15\frac{5}{8}$ in. approximately. Both types are also supplied with larger feed and receiving trays for paper of longer length.

(3) Feed. Whether hand feed or auto feed. The latter is more precise, faster and simplet. (The former is mainly used on systems machines where few copies only are required.) Capacity of feed and stacking trays. Whether counting mechanism available and if it can be preset.

(4) Fluid control. Whether by gravity feed from a plastic container; automatic pumping synchronized with revolutions of the printing cylinder: capillary feed through a wick: type of fluid: pressure controls.

(5) Print control. Positioning of master. Ease of attaching master. Some machines have automatic clamping and releasing of master.



Left: Electrically Operated, Automatic Spirit Duplicator.
Right (*top*)*:* Electrically Operated, Systems Spirit Duplicator.
Right (*bottom*)*:* Hand Operated Spirit Duplicator.

(6) Speed. Efficient operating speed is around 90 copies per minute. Slower operation results in denser copies and shorter life of the master. Faster operation results in weaker copies.

Special machines are available for systems work. These may be hand or power driven, for standing or sitting posture. The output may be to the front or back to the operator. The cost is considerably more than for normal machines and typical uses are purchase order, invoicing and billing systems.

Line selector machines are even more advanced costing several hundreds of pounds. These machines will duplicate the complete information and select and duplicate sections of information from any part of the master. Typical applications are works tickets, production control, sales and order analysis, etc.

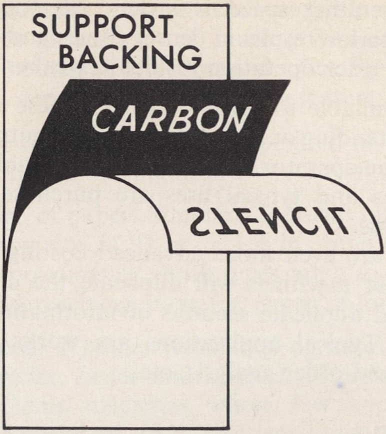
10. Stencil Duplicating

The basic method of stencil duplicating is by means of a prepared "master" or "stencil," on which the required image is cut by various means. The stencil is then fastened to the printing cylinder or cylinders on the duplicator. When the cylinder revolves against a hard surface impression roller a controlled amount of ink is pressed through the image "holes" in the stencil onto the copy paper. Originally the stencils consisted of a wax coated sheet of paper, but today they are made with a different and more reliable coating. This, combined with the various methods employed in the cutting of the stencil, plus the continual development of the duplicating machine itself, has maintained universal use of the process.

Moreover, the popularity of stencil duplicating has increased in spite of other developments in office copying and duplicating because the process is comparatively simple and can be undertaken by most office staff. The various ways in which stencils are prepared have increased the scope of reproduction beyond the usual typewritten script. Simple drawing, tracing, handwriting, can be added easily. More advanced work requires specially processed stencils. The following describes briefly the various types of stencils and methods of preparation.

Stencils and Stencil Preparation

The stencil sheet consist of a special type of base paper, made from exceptionally long fibres formed into a closely layered resilient web, which is coated with a nitro-cellulose compound. It is attached to a strong manilla backing-sheet along the top edge; the backing-sheet is treated with an oil-resistant protective coating or, alternatively, a greaseproof sheet is placed between the stencil and an untreated backing. The head of the backing-sheet is punched with holes or slots in various shapes and sizes, each pattern designed to fit on to one



Stencil Assembly.

particular type of rotary duplicator (for flat duplicators the heading is plain). Some fittings are punched suitable for use on more than one duplicator. Each stencil is printed with registration lines to guide the user, these show the layout areas of the standard sizes of paper used on the duplicator. Further assistance is given by printing vertical scales down each side which correspond with the vertical-line spacing on a typewriter, and horizontal scales at the top and bottom showing standard letter-spacing for pica and elite type sizes.

When the stencil is cut, the coating is displaced but the base tissue remains intact holding together the shapes of the letters; in particular it prevents the falling out of "window" letters such as "o," "d," "p," "b," "g," "q," "a," "e." The sensitivity of the coating and the strength of the tissue combine to determine the uniformity of the letters; the definition of the duplicated copies; the wear factor when the stencil is in use on the duplicator. Corrections can be made with the use of a correcting fluid.

Duplicator stencils with wax coatings are no longer made. For many years they have been replaced by the nitro-cellulose stencils which are manufactured to a consistently high standard of quality by precision methods and laboratory controls. Stencils may vary in degree of quality according to manufacturers' specifications, but the following characteristics should be featured in a reliable quality:—

(i) It should be sensitive yet able to withstand handling without damage.

(ii) Give uniform and clear-cut impressions.

(iii) Require no special skill in typing other than the usual care expected when cutting stencils.

(iv) Be suitable for long-run duplicating and for re-runs.

(v) Perform well in varying climatic conditions.

(vi) Clogging of the type face should be reduced to the minimum.

(vii) Should be anti-static, resisting the pick up of paper fluff or copies when duplicator is running.

(viii) Have no objectional odour.

(ix) Not contain any injurious acids.

(x) Not deteriorate in suitable storage.

The various types of stencils and method of preparation are as follows:—

Standard Grade: For use on manual or electric typewriters, usually supplied in white. They can also be cut with a metal stylus or wheel pen.

Extra Sensitive: Sometimes described as "noiseless" stencils. They have a very sensitive coating which is produced specially for typing on silent or noiseless typewriters which have an extra light touch. Usually supplied in white.

Tracing Stencils: These stencils are semi-transparent and usually supplied in red or blue. An existing sketch, plan, or printed form is placed underneath the stencil, face upwards, the design is cut with a metal stylus or wheel pen by tracing over the details which can be seen clearly through the stencil.

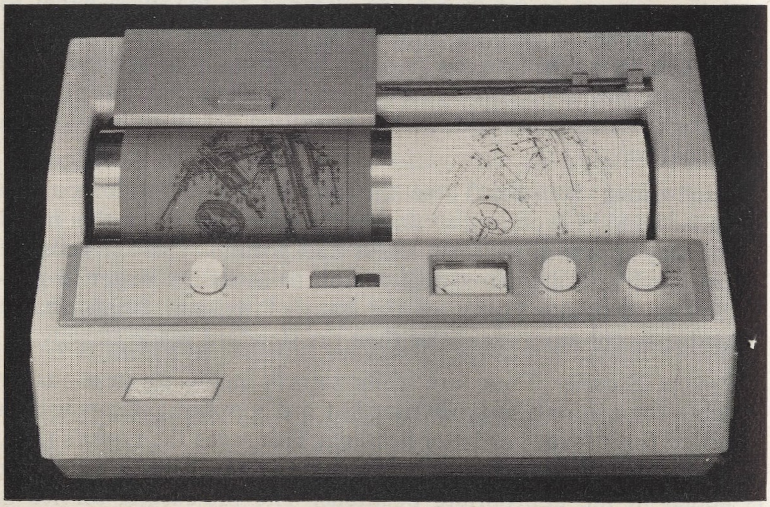
If much of this type of work is undertaken a writing or ruling frame is recommended. This consists of a glass panel fitted to the top of a box and illuminated from the inside by electric light. The stencil and the original to be traced are clamped to the glass panel to prevent slipping. A useful attachment to this apparatus is a T-square which can be moved into any position horizontally or vertically and locked into position. Tracing stencils are equally suitable for use on the typewriter allowing additional typewritten details to be added in the usual way.

Handwriting Stencils: These are double coated, white on the underside and blue on top, so that as the letters are cut with a metal stylus they appear in white on a blue background. These stencils are overprinted with a squared registration to assist the writer in producing an accurate layout of the lines of writing. Being double coated they are more expensive than the standard grade stencils.

Pre-cut Stencils: These are white stencils made up in a quality suitable for use on the typewriter but are supplied pre-cut with a standard form layout or letter heading. This saves the typist's time, by eliminating the cutting of the repetitive details. Additional typing is added in the appropriate positions. The pre-cutting service is provided by the stencil manufacturers, as the cutting process requires a special technique using precision printing machines. A wide variety of type styles is available and crests or trade marks can be included from specially engraved stencil cutting blocks; solid areas should be avoided. Pre-cut stencils make it possible to use the duplicator for the production of many business forms with permanent and variable matter, in one operation, and at low cost. Some of the most popular forms are: bills of quantity, timetables, stockbrokers' lists, trade statistics, countless types of internal office forms, factory or warehouse stock sheets, specifications, letter headings; and many other items which otherwise would have to be printed at a higher cost. The price for supplying pre-cut stencils depends upon the amount of typesetting and/or blocks required, combined with the number of stencils ordered in one delivery.

Electronic Stencils: Described also as a "plastic" stencil they differ from the normal type in that they are cut on an automatic electronic stencil cutting machine and are not suitable for use on the typewriter. An existing or prepared original is needed. The stencils are made up on a backing sheet in the usual style, with a punched heading; but the stencil sheet is specially treated with a dark grey or black coating which acts as a conductor of electricity.

An electronic stencil cutter consists of a pair of revolving drums to which the original and stencil are attached side-by-side. A photo-electric cell scans the original and is connected electrically to a stylus which moves in unison over the stencil, burning minute holes in the coating. The photo-cell controls the stylus so that varying degrees of light and dark cause the holes to be burnt at different intervals, thus



Electronic Scanner.

reproducing the variations of tone on the original. Some machines have variable pitch; this means the number of scanning lines per inch can be adjusted. The greater the number of lines, the more accurate the reproduction will be, but the longer the machine will take to cut the stencil. Originals in black and white are preferred, but other colour combinations can be used. After cutting, the stencil is fitted to the duplicator and copies run off in the usual way. Electronic stencils are suitable for long runs at high speeds.

This method offers considerable scope in making duplicated copies from almost any kind of original, including printed forms and headings, line drawings, cuttings from newspapers and catalogues, paste-ups, and even coarse screen illustrations from photographs. The electronic stencils and scanning equipment can be purchased by the user, or alternatively the suppliers will undertake the processing from an original supplied by the user and produce one or more stencils, as required, ready for the duplicator.

Brush Stencils: These are made with a special coating and the image is etched by a special fluid applied with an artist's brush. They are used for poster work and notices requiring bold lettering or line illustrations. Different sizes and types of brushes are used to create varying effects. Although some artistic skill is an advantage, it is possible to produce quite pleasing results with lettering guides, drawing the layout on a separate sheet of paper which is placed under the brush stencil and used as a tracing guide. These stencils are not supplied for typewritten work although portions of typing can be included if made before the application of the brush fluid; also hand work with wheel pens and shading plates can be added. After preparation the stencil is fitted to the duplicator and copies are run in the normal way.

Photographic Stencils: The use of these has been superseded to a large extent by the electronic stencils except for certain specialized work.

The coating on photographic stencils is sensitive to light and the process has to be carried out in subdued lighting conditions. A specially prepared original on translucent material is placed over the stencil, pressed into contact under a glass panel in a frame and exposed to bright tungsten lighting for a specified period. The stencil is then processed or "cut" chemically by attaching it to a drum which is fitted and revolved in sequence in three separate troughs of fluid. After drying, the stencil is attached to the duplicator and copies are run in the normal way.

Photoscope Stencils: Another method of producing the image, is by projection of the original on to the stencil through a lens, using an apparatus similar to an enlarging camera; by this means the original image can be enlarged or reduced as required.

The preparation of the originals and the processing of the stencils for photographic and photoscope methods requires special skill and, therefore, this method is reserved for selected applications.

Diapositive Stencils: Also known as litho stencils and mechanical negatives. They are supplied for users of offset litho printing machines in the preparation of photo-sensitized printing plates.

Sundries required for Stencil Preparation

Stencil Carbon Papers: Each box of stencils contains a supply of carbon paper. The carbon is placed underneath the stencil face upwards; it has a two-fold function. Firstly it proves a "cushion" for the type face which assists in producing clear-cut and even characters and also helps to prevent the cutting out of letters if the type is very sharp and the platen is hard. Secondly it enables the typing to be read easily because it shows up the letters in black. *Single-sided standard-weight* carbon meets most requirements but three other grades can be supplied on request to meet special circumstances. A *heavyweight* which gives a broader cut, used by typists with a light touch and also for users who prefer the duplicated copies to look bolder. *Double-sided* which assists in cutting in the normal way and in addition enables a proof copy to be made. *S.T. or Special Grade* for use with shaded-face type styles, it helps in obtaining better results from these type styles which are not suited to first-class stencil cutting. Some stencils are supplied pre-interleaved with carbon.

Correcting Fluid: This is supplied in small bottles fitted with a screw cap to which a small brush is attached. It is a volatile liquid coloured pink or white for normal use (and in black or orange for diapositive stencils). The fluid is applied to the stencil sparingly with the small brush and fills in the letters typed wrongly; it dries rapidly leaving a surface film over which the correction can be typed. The cap should be replaced immediately to prevent evaporation which would cause thickening and eventually render it useless.

Stylus and Wheel Pens: Various types are available for handwork on stencils. The stylus pens are used for writing or drawing and have various sizes of ball points or are straight pointed. Wheel pens are used for ruling lines, they are fitted with various kinds of cutting wheels to produce different line effects such as dotted lines, thin lines, dash-dot, broad, double, stave lines for music writing and so on.

Writing Plates: When cutting stencils by hand and if an illuminated writing frame is not used it is necessary to have a writing plate. This is a rough surfaced plastic sheet, or silk covered metal plate for use with the stylus; or a smooth surfaced plastic, zinc or aluminium plate for use with wheel pens. It is placed under the stencil, embossed or smooth side uppermost, providing a slightly rough surface which enables the stencil coating to be removed more effectively. Writing plates are usually supplied in foolscap size, also smaller sizes, known as signature plates. Another type of plate has embossed designs moulded to obtain shaded effects, or outlines, of well known symbols; the cutting is performed with a special tool which is rubbed over the surface of the stencil on to the plate.

Plastic Top Film: Although the use of high grade stencils has reduced type filling to a minimum, some users prefer to have a sheet of film placed over the stencil when typing as this eliminates completely any type filling. It is particularly useful if many stencils are being typed, as there is no delay for type cleaning. When typing through film a firm steady touch is used with a little extra pressure for capital letters. A broader cut is obtained with film which also helps to camouflage any uneven typing. It is useful for typewriters with a very sharp type, or heavy touch typists, to prevent cutting out of letters, particularly the "window" letters. Film is not recommended for fine line duplicating. Stencils can be supplied with the film attached at the heading, but this adds to the cost of the stencils and it is more economical to use loose sheets, each of which is good for about three stencils. It is thin but very resilient, allowing the type to sink into the stencil, displacing the coating. The film itself is not cut and this prevents the stencil coating making contact with the type faces.

Ink: Duplicator inks are blended to suit the individual requirements of each type of duplicator and because there are many different kinds of duplicators it is essential for the correct grade of ink to be supplied. It must be remembered that duplicator inks have to dry mainly by absorption whereas other printing inks can be made with solvents which evaporate quickly and accelerate the drying. This is why special duplicator paper is used in conjunction with the ink. Thus the performance of the ink is to some extent dependent upon the grade of the paper. Technical advances in both trades have shortened the drying time factor resulting in higher speeds on the duplicator. Excellent results are obtained on duplicator papers of improved appearance using quick-drying emulsion inks. Apart from this the following characteristics should be present in high grade duplicator inks:—

(i) Good definition of impression.

(ii) Minimum show-through, on suitable paper, for two-sided duplicating.

(iii) No oily fringes to letters.

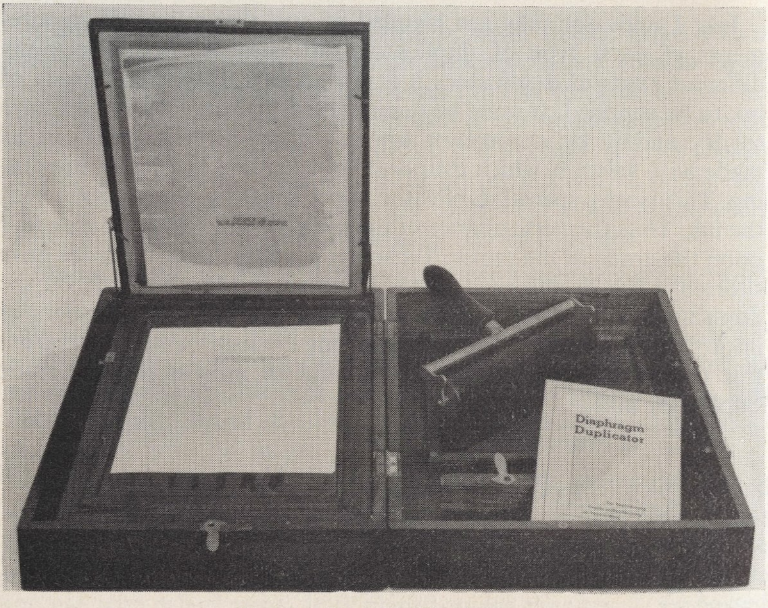
(iv) Quick drying, on suitable paper, to allow stacking and folding of copies in shortest time.

(v) Economy in use (maximum copies from one tube of ink).
(vi) Efficient and uniform distribution of ink on the machine.
(vii) Good storage life in even temperature.
(viii) Not cause creeping or clogging of the stencil.
(ix) Minimum change in performance due to climatic variations.

Machine Systems

Some knowledge of duplicator operating systems is helpful in appreciating the grade of ink required. The following is a general guide to the various types of duplicators, explaining the differences. They can be divided into three categories.

Flat-bed Portable Duplicators: Known also as flat diaphragm duplicators they are intended for producing a small number of copies, up to say 100, and are supplied mainly to schools, restaurants, social clubs; although they are gradually being replaced by the low priced portable rotary machines. The equipment consists of a shallow wooden case containing, in one half, a flat rectangular platform the size of the stencil, to which a wooden frame is hinged at the top edge. The frame contains a silk fabric screen held taut by its four edges. In the other half is a flat block with narrow sides to form a tray; there is space to include a tube of ink and a rubber roller about eight inches wide, fitted by a spindle to a metal frame with a wooden handle.



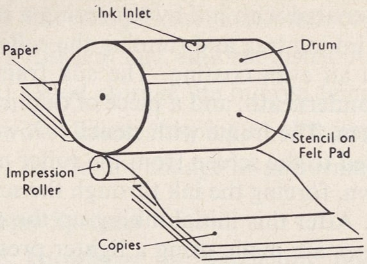
Flat-bed Portable Duplicator.

To operate, the rubber roller is coated with ink by squeezing a small quantity from the tube into the inking tray and running the roller up and down in the ink to obtain an even coating. The silk frame is lifted, the stencil fastened to it underneath, and a piece of duplicator paper placed on the base platform. The frame with stencil is lowered on to the paper and ink is applied to the screen from the roller using a firm even pressure up and down, forcing the ink through the screen and the stencil on to the paper. After this initial inking-up the copy is checked, and subsequent copies are made using a lighter pressure and by opening and shutting the frame to insert each piece of paper.

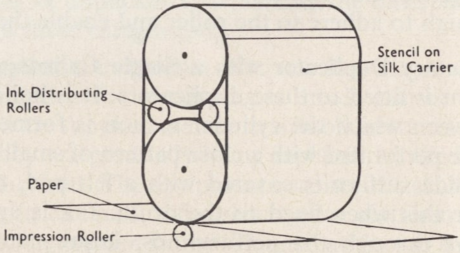
Inks for this duplicator are the paste type, the viscosity being high enough to adhere to the roller and enable the flow to be controlled.

Rotary Duplicator with a Single Cylinder: One large cylinder or drum is fitted to these duplicators. It is hollow with solid end discs between which the cylinder section is formed from a curved metal plate perforated with a close pattern of small holes. The whole of the outside surface is covered with a felt pad, the stencil being placed over this when fixed to the drum. Ink is applied inside the drum, flows through the perforations, impregnates the felt pad, and is pressed through the stencil on to the paper by an impression roller. On some models the cylinder is made with a rectangular aperture across the width, approximately 5 in. deep, to allow the ink to be squeezed from the tube in small quantities, as needed. These are known as open drum models. Distribution of the ink is by a roller fitted on a pivot inside the drum, operated externally by a swinging movement to spread and press the ink through the perforations. For some of the more simplified portable machines just a flat brush is used to spread the ink by hand. The larger all-electric machines are fitted with an automatic inking system inside a closed cylinder. A whole tube of ink is emptied into the drum through a small screw-capped aperture. The internal inking mechanism agitates and spreads the ink when the machine is running and can be adjusted. Specially blended quick drying fluid inks are used for the closed drum automatic systems, the viscosity providing even flow and minimizing seepage of ink when the machine is not in use. Inks applied by hand for open drum models will vary, the viscosity being governed by the nature and porosity of the felt pads fitted.

Rotary Duplicators fitted with Twin Cylinders: On these machines the ink is distributed by a silk band or carrier which revolves around two cylinders postioned slightly apart, one above the other. Further ink distribution across the width of the silk carrier is achieved by cloth covered "waver" rollers which slide to and fro against the underside of the revolving silk band. This achieves an even spread of ink over the silk in every direction when the machine is running. The stencil is fastened to the machine on top of the silk carrier and in



SINGLE DRUM SYSTEM



TWIN CYLINDER SYSTEM

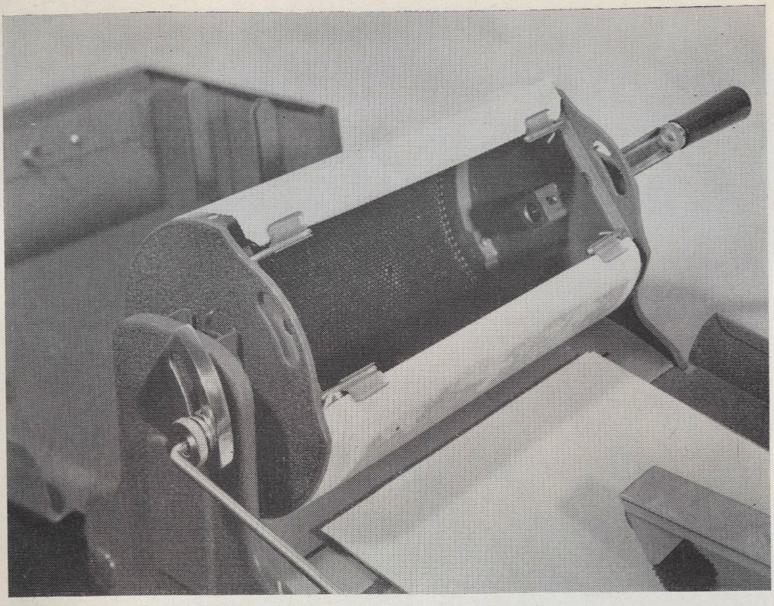
Rotary Duplicator Systems.

close contact with it. Application of the ink can be made by hand direct from the tube by squeezing a quantity across the top cylinder where it is picked up and distributed as described. Alternatively the ink tube or container is fitted at the side of the machine with the nozzle clamped to a metal tube which conveys the ink to a position between the cylinders, where it is forced through small holes in the tube across the width of inking silk. The tube feed mechanism is automatic but, if required, the operator can manipulate the ink controls when the machine is running and cut off the supply temporarily, or apply the ink to selected sections of the stencil, such as the middle or the sides.

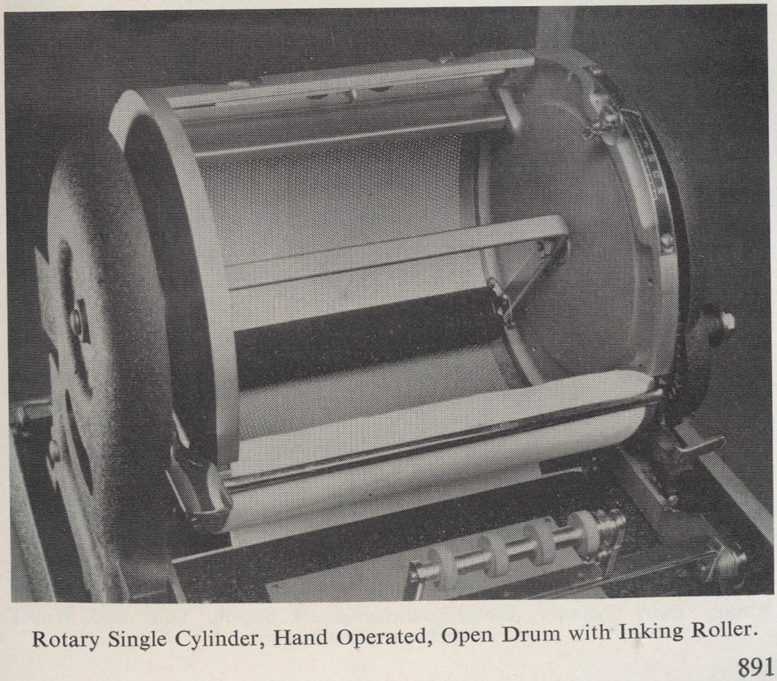
For automatic inking the ink must be of a consistency which flows freely through the tube feed system but not too thin or it will flow from the edges of the silk carrier and fly off the machine. A special paste type ink is required with quick drying properties. The ink for hand application can be a little thicker.

Machines

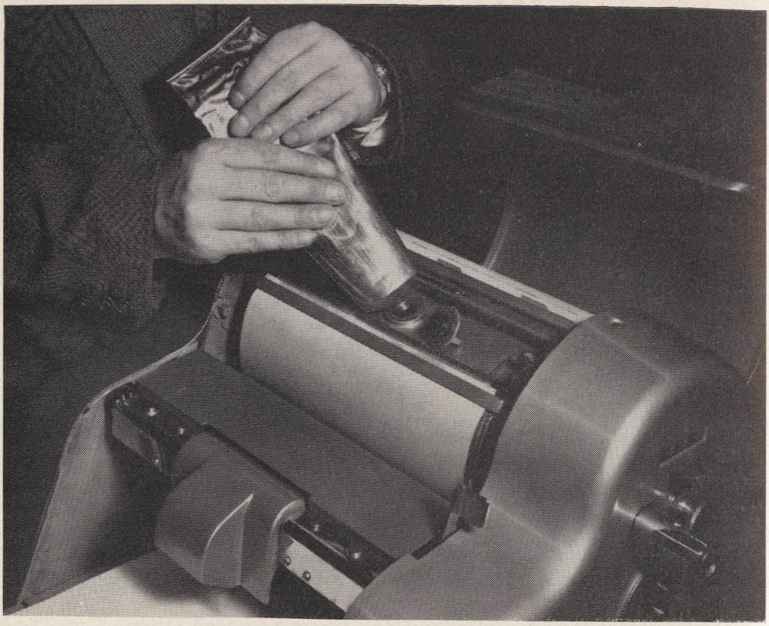
These are either flat-bed, single-cylinder rotary, or twin-cylinder rotary. Although flat-bed machines are inexpensive, they are not suited to long runs, so the majority of machines sold are the rotary type, either table top or floor standing models. Prices vary from a



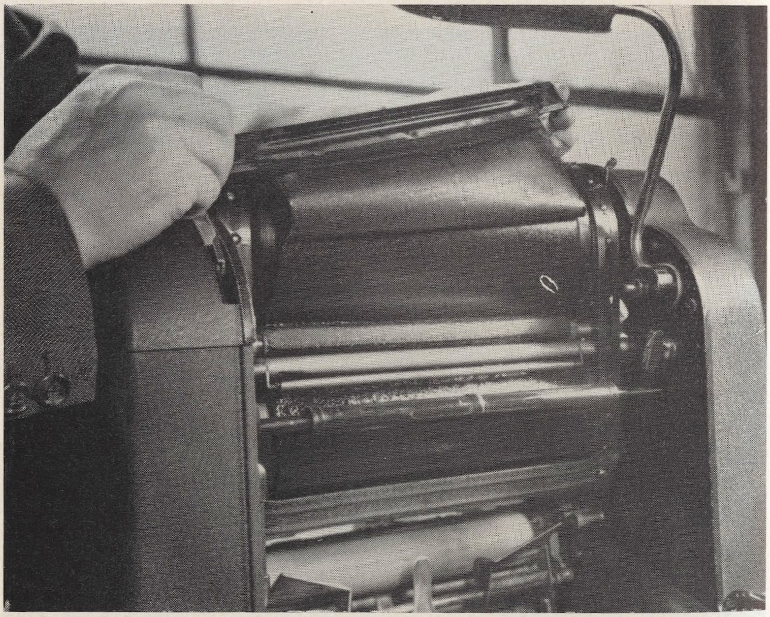
Rotary Single Cylinder, Hand Operated, Open Drum.



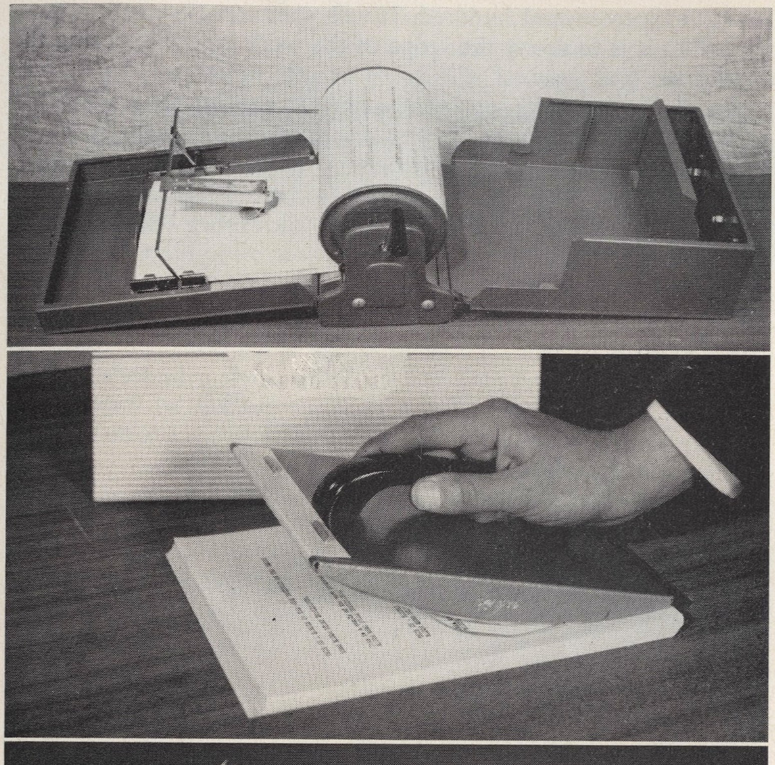
Rotary Single Cylinder, Hand Operated, Open Drum with Inking Roller.



Rotary Single Cylinder, Electric, Closed Drum with Inking Aperture.



Rotary Twin Cylinder, Electric, showing Ink Supply Tube and Waver Distribution Rollers.



Hand Operated Portable Rotary Duplicator.
Hand Pad Duplicator.
Hand-Print Rotary Duplicator.

few pounds to several hundred. It will, therefore, be realized how important it is to assess the scope of the work before choosing the duplicator.

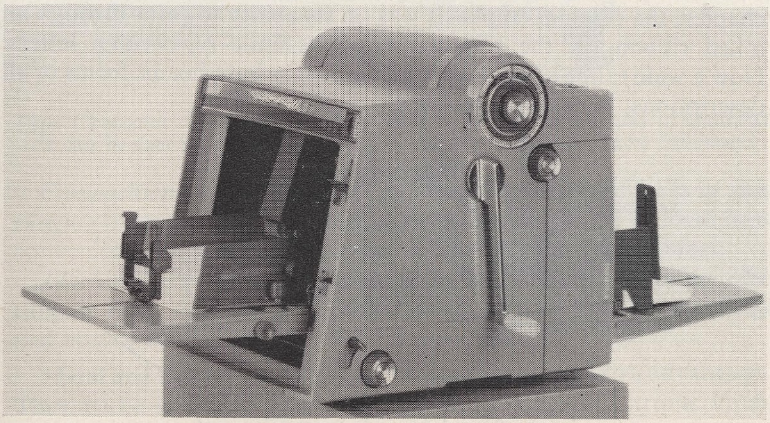
Flat-bed, Small Hand-print Rotary or Pad Methods: These machines are inexpensive, costing only a few pounds. They produce copies with a good standard of appearance, the output being limited because of the slower speed of processing. They are extremely popular with restaurants, inns, social and sports clubs, church organizations, small offices and shops, where the requirement is a short run of reasonable quality work at low cost.

Single- or Twin-cylinder Rotary Machines: Whether to choose a single-cylinder or twin-cylinder machine is a question of personal preference—both give good results. Some single-cylinder machines allow colour changing to be carried out quickly by merely substituting a spare drum with the new colour. There is a wide range of machines, and features affecting choice and price are:—

(1) Power. Whether hand operated or electrically driven.
(2) Size of Paper. 4 in. × 2 in. up to 17$\frac{1}{4}$ in. × 19$\frac{1}{4}$ in.

Removing the Drum of an Electrically Operated, Single Cylinder Duplicator.

(3) Feed. Automatic or hand feed. If accurate register required suitable for colour work. Suitability for feeding small paper and cards from long or short side. Loading and capacity of feed tray. Does machine deliver copies perfectly stacked: especially important for two-colour printing. Counting device; the less expensive models are not automatic, they merely record the number of copies taken. The automatic counter enables the machines to be set in advance for the required length of run and stops the machine when the exact number of copies has been printed.



Electrically Operated Twin Cylinder Duplicator.

(4) Inking, Automatic or Hand. Automatic inking is essential for high speed duplicating. It is economical, efficient and clean. The controls are set and the machine supplies the exact amount of ink needed until the end of the run. Little supervision is required by the operator after switching on.

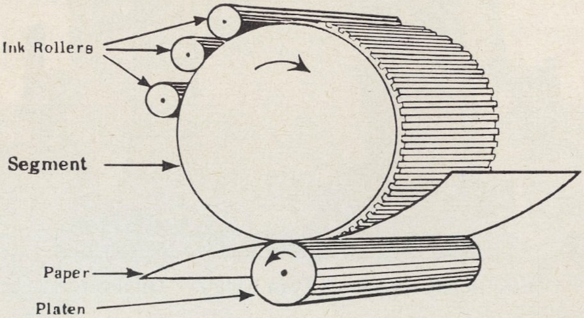
(5) Print control. Some machines allow changes in the position of the printing even when the machine is running. The copy can be adjusted up, down or laterally and on some machines obliquely. Colour Change—Speed of colour change operation and amount of risk of dirtiness involved. Ease of fixing the stencil.

(6) Speed. Electric machines vary, producing up to 100 or 180 copies per minute. Check speed control variations available.

Another factor which buyers may consider when choosing a duplicator is the availability of staff to prepare the stencils and operate the machines. Although the procedure is reasonably straightforward, with some duplicators it is necessary to have a member of the staff available to ensure the machine is operated and maintained satisfactorily. Expert knowledge is required for the installation of the systems machines and the suppliers usually employ a skilled team of salesmen who investigate, plan and advise on these.

11. Letterpress Duplicating

This process is one using the principle of relief printing, *i.e.*, printing from raised surfaces, which have been suitably inked and then applied to paper under pressure. Although the basic principle is similar to that used for letterpress printing, as described in an earlier chapter, the original emphasis was on its ability to print through an inked ribbon for the production of facsimile typewritten letters. Now a wide range of work is possible such as letterheads, forms of all descriptions, sales literatures, etc.



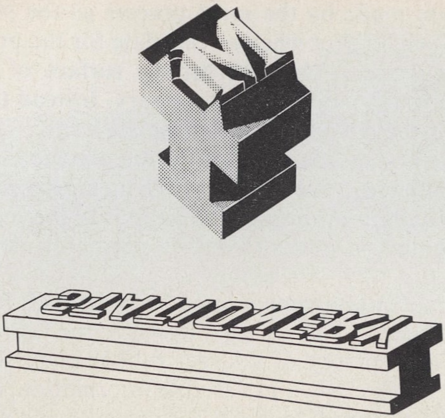
Basic Design of Rotary Letterpress Duplicator.

Rotary Method

Type: All the media supplied to the letterpress printer can be adapted for use on the duplicator; the only requirement is that they be made in such a way as to provide attachment to the curved segment which is the equivalent of the printers formes.

The type character is cast on a "waisted" body which permits it to be slid and held between the rails of the segment. It is only in this respect that it differs from the conventional printers' type which is cast on a longer body and which has no waist.

Semi-Automatically Set Type: This type is specially cast for use in a typesetter. The typesetter affords compact storage of up to 7,000 characters of type and spaces, plus a quick and easy means of composition. Pica and Elite typewriter styles are available for the production of facsimile typewritten letters duplicated on the machine through a ribbon. These two styles are also made with a broader face for ink printing.

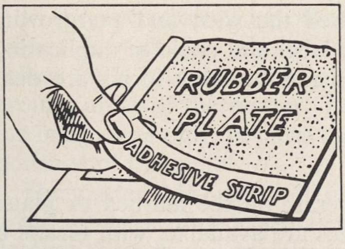


Type Character showing "Waisted" Body. Words or phrases in continual use can be cast as a single "slug", the waist extending along its full length.

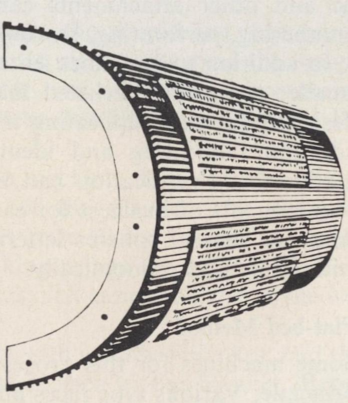
Composition Type: This type embraces a selection of faces in sizes ranging from 6 point to 24 point. The type is composed by hand from conveniently arranged compartment trays on the type cabinet.

Display Type: This type comprises several type faces in sizes ranging from 30 point to 72 point. It is curved to eliminate breakage and ensure an even, high quality impression.

Metal and Rubber Plates: These plates offer many extra advantages. They make it possible to duplicate illustrations of various kinds. They save valuable time that would otherwise be spent in composing and distributing type for copy that must be duplicated frequently. They also provide for layouts which would not be possible or practicable with loose type; examples of this are complicated ruled forms, type set in diagonal lines, type set in curved lines, and so on.



Rubber Plates can be fixed to the Forme with adhesive strip.



Type Segment.

These plates are made by the same process as the plates made for the letterpress printer, but whereas the plate for the printer has to be mounted on a wooden block to lift the surface of the thin plate "type high," no such mounting is necessary. Instead the plate has to be curved to fit the circumference of the segment.

The usual method of attaching the curved plate to the segment is by use of marginal bands. These are flexible metal strips which are laid over each side margin of the plate to strap it to the segment. Rubber plates are mounted on sheets of curved plastic or metal to facilitate attachment in this way.

Other methods of attachment have been devised, including sticky backed rubber plates which adhere directly to the forme or to a blank area on the plastic mount of a larger rubber plate. This latter idea provides for a quick change of variable information, and the rubber stick-ons can be removed and filed for use over and over again.

Type Segments: One advantage of this method is the ease and speed with which type can be prepared for duplicating. After composing, the lines of type are slid into the channels of the segment and clipped into position. With no further preparation it is then ready for duplicating.

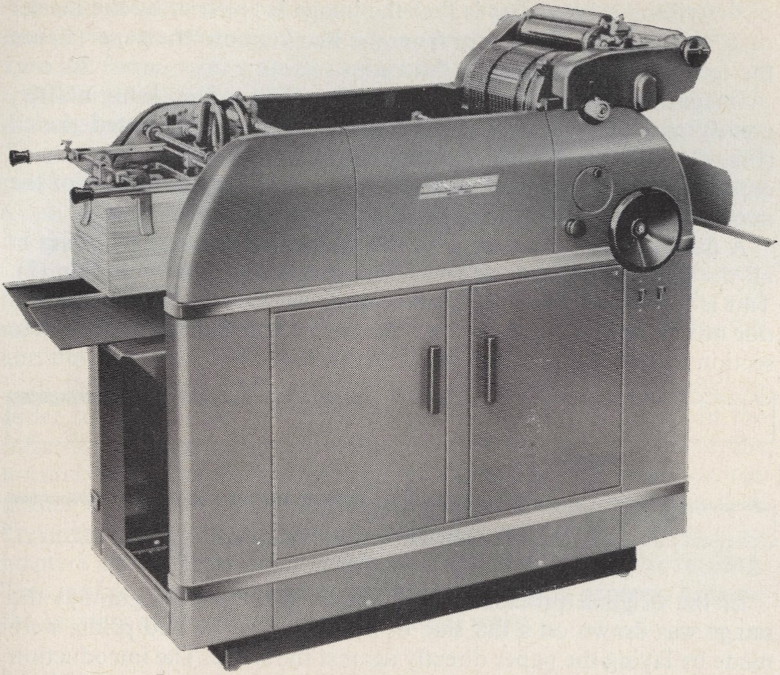
The wide variety of work that is possible has necessitated development of several different type segments. Basically this is a variation of the number of channels and area of size available for reproduction.

Machines: These are electrically operated, but can be hand or auto fed. Speed of operation is from 3,000 to 6,000 copies per hour and they can print on a minimum paper size of 3 in. wide × 5 in. long, up to 11 in. wide × 16 in. long. Printing area will depend on whether the machine is being used for ink or ribbon work and the size of segment in use. The range of paper and board substance is from 13 lb. bond up to boards of 1/16 in. thickness. The inking is automatic and other attachments can be used according to need, *i.e.*, numbering, perforating, scoring, slitting, etc.

In addition to machines suitable for printing from the flat sheet, smaller types are marketed that are fed from the reel. These are designed for the duplicating of labels, tickets of various sizes. In addition imprinting and identifying work is easily carried out. Under this classification can be listed the wide and evergrowing requirements of business for carton, label and package duplicating. In more general spheres letterheads and business forms are dealt with easily and economically.

Flat-bed Method

Some machines for this process, operate on the flat-bed or platen principle. Various type faces and sizes are available, with means of housing and setting the type. They will print from lino cuts, electros



Rotary Model Letterpress Duplicator.

and zincos and use ordinary printers ink, which is applied by hand, with an inking roller, or in some models by rollers fed automatically by an ink duct. Whilst they fulfil the needs of some users, they are not really suited for office reproduction requirements.

12. Offset Duplicating

Offset lithography owes its existence to the simple fact that grease and water do not mix. Words, lines, or pictures (termed the image) are put on the surface of the master, using a medium containing grease. This greasy image repels water, but has an affinity for the greasy lithographic ink.

In the operation of an offset-litho machine, damping and inking rollers contact the whole surface of the master. The damping rollers lay a protective film of water over all the "white" or background areas of the master. The inking rollers lay a film of ink on the image area only, because the greasy ink cannot adhere to the wet portions of the plate.

The master is brought into contact with a rubber blanket, and the inked image is transferred from the master to the blanket. Paper passing through the machine comes into pressure contact with the blanket, and the inked image is transferred to the paper. One way of describing this process is that the image is PRINTED by the master on to the blanket, and OFFSET from the blanket onto the paper; hence the term "offset lithography."

Imagine looking at a cross section of an offset litho master, greatly magnified. It will appear similar to the exaggerated sketch (Fig. (1)). The surface is covered with millions of tiny pockets or cups. Fig. (2) shows how a greasy image laid on the surface of the master fills in some of these pockets.

A damping roller passes over the surface of the master, filling in all the bare or non-image areas with water, as shown on Fig. (3). This is followed by an inking roller; because water and greasy ink do not mix, a film of ink is laid on the image area only, and the cross section of the master then appears as in Fig. (4).

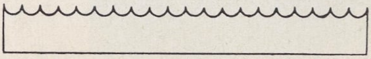


FIGURE 1

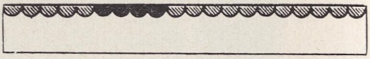


FIGURE 3

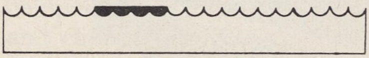


FIGURE 2

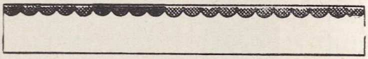


FIGURE 4

In the original process of lithography (Direct Lithography) the image was drawn on a flat slab of stone in reverse, and prints were made by laying the paper directly against the stone. The introduction of other "master" materials, flexible and more convenient than slabs of stone, permitted the design of rotary-action machines and the development of OFFSET lithography. Masters are now imaged "in the flat," and then curved around the master cylinder of the press for machining.

The next diagram (Fig. (5)) illustrates the most widely accepted basic design for an offset-litho duplicator or a commercial offset lithographic press. It includes three cylinders of equal diameter: the master cylinder (C)—the blanket cylinder (D)—and the impression cylinder (E).

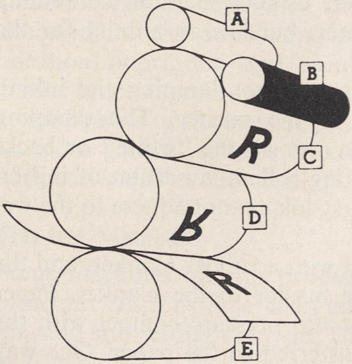


Figure (5)
Basic Design of Offset-Litho Duplicator.

It also includes (A) a damping roller (usually a system of rollers) and (B) an ink roller (again, usually a system of rollers which includes TWO ink forme rollers which contact the master).

All larger machines follow this design with three cylinders of equal diameter, and moisture and ink applied from SEPARATE roller systems. This is the design recognized, by most commercial lithographic press manufacturers, as being preferable for the most demanding kinds of work where large areas of colour, either solid or tone, are involved.

However, in the smaller range at least one manufacturer has perfected their own machine design together with inks, fluids and methods of applying them. Some use separate roller systems for ink and fluid—others incorporate both in the same roller system.

In the letterpress process, type needs to be set "backwards" in order to give the correct left-to-right reading on the paper. In the offset-litho process, however, the masters can be imaged in the normal way. The diagram (Fig. (v)) shows that the image on the master is positive; on transfer to the blanket it becomes negative or "reversed"; but when offset onto the paper, the image is returned to positive again . . . in other words, the right way round for reading. This makes offset-litho well suited as a duplicating process, because the masters are prepared in easy, natural ways.

Masters

In terms of material these may be of two kinds and the use of either is dependent upon the number of copies to be run off, the method used for imaging, and quality of copy required.

Paper: These are made from a special type of plasticized paper or a specially coated paper and are used primarily for short-run work up to about 5,000 copies. The imaging of this type of plate is normally by "direct" methods and they can be obtained as individual plates or in roll form for continuous feeding into typewriters, teleprinters, tabulators, and electronic computers.

Metal: These may be aluminium or zinc plates and as a result cost more than the paper type. They are, however, more suitable for runs of up to 25–50,000 copies and necessary for higher quality reproduction. (Other types of plates known as "deep etched," "bi-metal" and "tri-metal" are used where the printing run is progressively larger. These are used principally for the larger offset printing machines, and are referred to in the chapter covering printing processes.)

Imaging the Master

Plates or masters can be imaged in several ways, but no one kind of master is suitable for imaging by all methods. In point of fact the business of master making is now almost an industry in itself and it is not possible to give anything but a brief outline of the ways in which masters may be prepared. Basically the methods may be divided into two groups; Direct and Indirect Methods. As will be seen some methods are quite simple and inexpensive, whilst others, although not complicated, are a little more involved and certainly require special equipment. Space does not allow a detailed description or comparison of the methods.

Direct Methods

"Direct" simply implies that the image is put directly on to the plate without any intermediate process. The techniques are simple and corrections can be made by erasure. Care must be taken to ensure that the image is not erased completely. It is sufficient to remove enough grease so that it will not attract the ink. Special erasers are available for this purpose.

Typing: A special lithographic ribbon is used. Its grease content is both ink-receptive and water repellant. A light even touch is necessary if good quality reproduction is required and for this reason electric typewriters are often used.

Writing and Drawing: Either special reproducing pencils or ink are required. By these means illustrations, diagrams, sketches, etc., may be put on to the master, or added to typed work. They are easy methods, but dependent upon the skill of the artist for appearance.

Master from a Master: With some equipment it is possible to feed a blank master into the machine to receive a complete image which can be kept as a duplicate or to which additional original copy may be added, thus creating a new master.

Printers Proofs: The usual term is "repro proof." Printers type can be proofed directly on to the plate using a specially prepared ink. This has the advantage that previously prepared type (line or half-tone) can be used, which is a considerable saving in time and money.

A further use of this method is with pre-printed masters. These are particularly useful when certain information changes frequently, *i.e.*, price lists. Permanent copy can be pulled on a number of masters. Variable information is then added as required.

Indirect Methods

These methods transfer the original to the master by photographic or other facsimile means. It should be repeated that space only allows a brief mention of each method. Further, the choice and use of any one or more methods will largely depend on the number of masters required, quality, type of original and general economic considerations. Corrections are not so easily achieved and must be effected before the plate is made.

Photographic Masters: These are used when the highest quality reproduction is required from the plates. Reduction or enlargement of the original copy is possible by means of a process camera. Metal plates can be coated by the user with a light sensitive emulsion. For this a "whirler" is necessary, which by centrifugal force spreads the coating uniformly over the surface, which is then dried by warm air. The main constituents of the coating is egg albumen, with ammonium dichromate as the sensitizing agent.

However, this method involves skill and the use of additional equipment and it is now universal practice to use plates that have been pre-sensitized by the maker. They are available in plastic or metal, with a wide range of coatings, which may be negative or positive. These need to be handled in dark room conditions, but those made with diazo compounds can be handled in daylight.

The coated plate is put into position with a negative or positive, the same size as the image and placed in a vacuum printing frame which holds both in close contact while exposure is made by light. After exposure the plate is removed and developed by one of several techniques. With negative working plates the exposed portion remains hard and insoluble and becomes the printing surface of the plate. In the case of positive working plates, the exposed portion becomes soluble and is removed. Processing follows to make the image areas grease-attracting, desensitizing the remainder, gumming and lacquering to prevent oxidization. All this can be carried out by the use of solutions, in a few minutes.

Negatives for Presensitized Masters: The production of photographic negatives need a process camera and dark room for developing. This can be overcome by having them made by outside photographers. Alternatively some photo-copying processes can be employed, *i.e.*, reflex, diffusion transfer, gelatine transfer. Exposure times will vary. In the case of diffusion transfer, reversal-negative papers can be used. These produce a black-on-white negative and from it a white-on-black positive. If this positive is made on clear film it can be used as an offset negative.

Mechanical negatives can be made from special stencils cut on the typewriter. Separate negatives are made of illustrations which are then spliced in with the text. The stencils are coloured to prevent the transmission of light during exposure. Yellow is the most usual but some are orange or black.

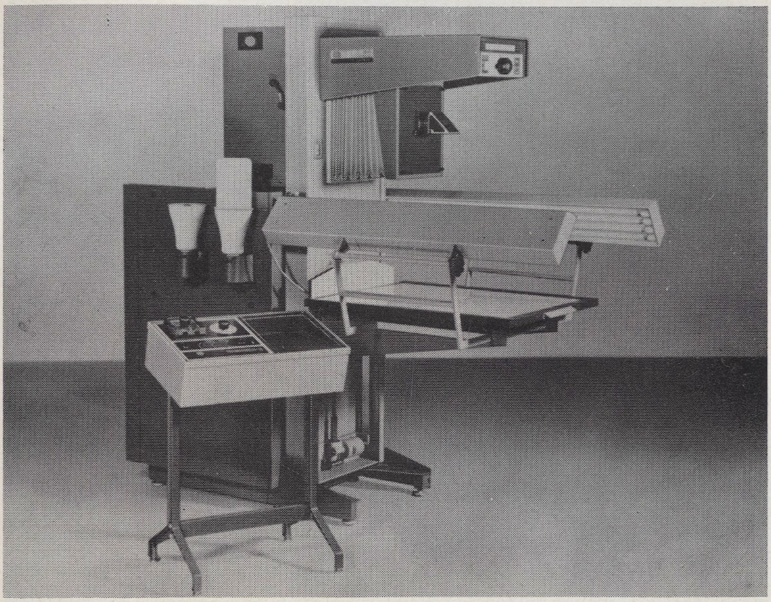
Positives for Presensitized Masters: As these are the reverse of negative, exposure must be in the non-image areas. They are coated with a substance that decomposes to light. They can be produced by diffusion transfer, electrostatics, dyeline and projection techniques. In processing the image remains light sensitive, so that it must be stored or protected from the light.

Small Offset Printing Frame.

Direct Photographic Positives: This method allows a paper plate to be made without any intermediate negative or translucency. The equipment is suitable for producing plates quickly and in quantity at low cost. This feature offsets the capital outlay of the equipment. They are suitable for runs of up to 5,000 copies. As the unit includes process lens and prism it works from a projected positive image which is made right reading by the prism and can enlarge or reduce.

With some equipment, different ratios of enlargements or reductions on the same plate, can be effected by two exposures.

Non-automatic equipment consists of a camera and processing unit; these are combined in fully automatic equipment.



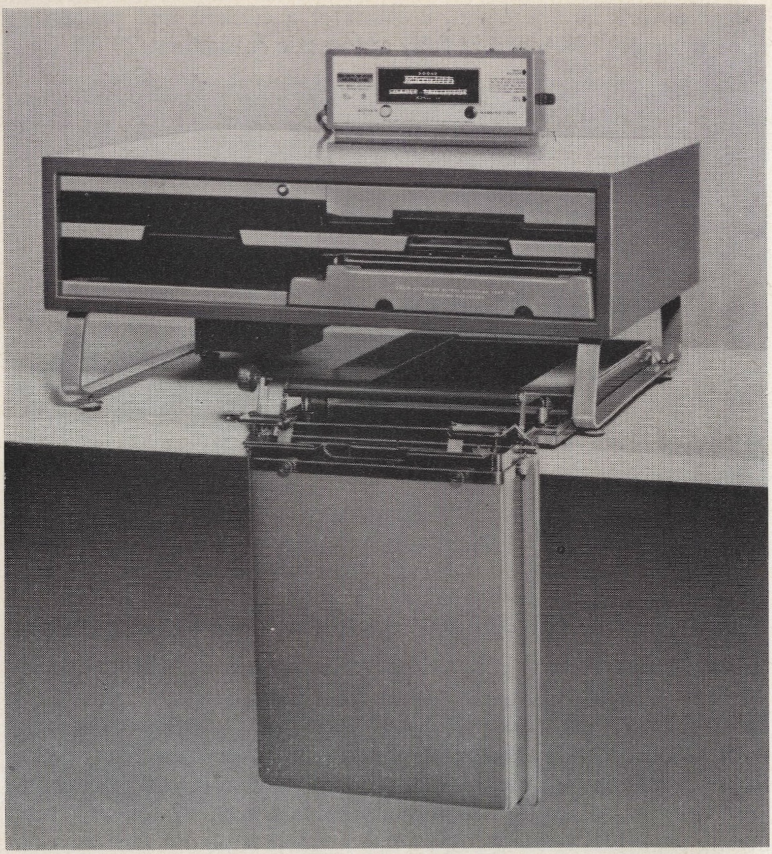
Automatic Direct Photographic Platemaker.

Diffusion Transfer: This method is similar to that used for making paper copies. It requires a flat-bed exposure unit with a vacuum head or other device for keeping original and master in close contact during exposure. After exposure the negative is placed face down in contact with a pre-sensitized metal plate. They are then fed through a developer unit after which they are peeled apart, the image having been transferred to the plate. This is then wiped with a fixative and lacquer.

Projection-speed negative paper can also be used which is exposed in a process camera with copy-board allowing enlargement or reduction.

Gelatine Transfer: Offset masters can be made by this process, although it is now more usual to use equipment that exposes through a lens rather than by contact exposure. This allows for enlarging or reducing. Although basically a darkroom process, a daylight loader-processor is available. Paper or metal masters can be made.

Infra-red Transfer: The methods employed for ordinary copying by this process can be used simply by using a paper offset master instead of the copy paper as the receiving medium. It is, however, only suitable for short-run work.

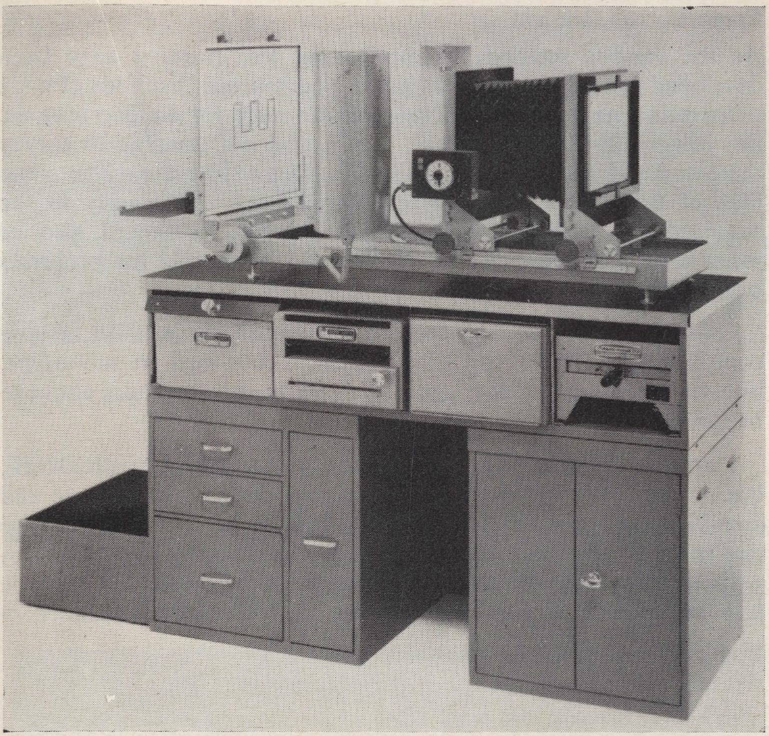


Daylight Loader-Processing Unit for Gelatine Transfer Platemaking.

Electrostatics: According to the equipment used, paper and metal masters can be imaged and enlargement and reduction is possible if a camera is also employed.

Masters can also be made of enlargements and reductions at different ratios by first taking a pull on paper and then re-photographing. A similar technique to the splicing of camera negatives.

Erasures can be made before the powder developer is fused and for two-colour work that is non-overlapping, two masters can be made from the same black and white original simply by wiping the unwanted areas for each master, off the selenium plate, or indeed off the master itself before fusing. Retouching of the master at this stage can be done by the use of a special eraser, which lifts off unfused powder images that may represent blemishes or specks of dirt on the original.



Electrostatic Automatic Platemaker.

Equipment employing a selenium plate to form an image produces a wrong-reading image that becomes right reading when transferred to the master. The transfer is effected manually with paper plates, but by using additional equipment, it can be done automatically for metal masters.

Other equipment images direct on to a zinc oxide coated metal master. This is a mirror image but it can be made a right-reading one by using a prism. Paper masters are made by an additional transfer unit. The metal master is imaged without the prism, and used as a transfer medium to make a right-reading paper master. After use, the metal plate can be cleaned and used again.

Facsimile Transmission: This method is similar to that used in making electronic stencils. The image is burnt through a top, water attracting coating of the master, to a second water repelling coating. The masters take longer to make than by other methods, but are ready for use when scanned. Most scanners can enlarge or reduce.

Preparing the Original

As the various methods of duplicating and printing have been developed for reasons of economy or convenience, methods of copy preparation have likewise developed not only for similar reasons, but principally for appearance. Again it is not possible to survey them in detail, but a brief résumé will suffice to give the reader some idea of the means available for reproducing very closely to the standards of traditional commercial printing. It should also be mentioned that some of the techniques are suitable for processes other than that of offset.

Cold Type: This term is used to distinguish the method of type composing by "hot type," or molten metal used in monotype, linotype and other similar typesetting machines, from those about to be mentioned.

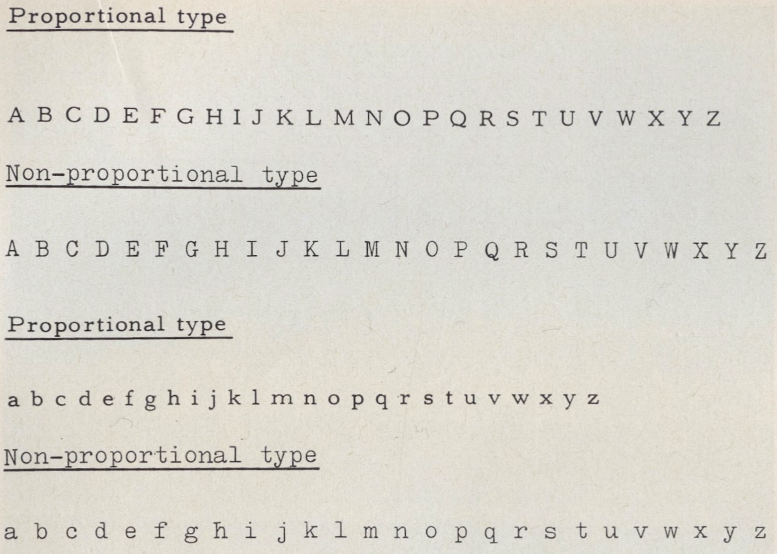
Photo Composition: This is suitable for the highest quality work, but normally is only used by trade sources due to its expense and complexity. It produces justified copy (that is the arranging of type and space to give lines of equal length) directly on to film or photographic paper. In addition to producing a large number of type sizes and faces, enlarging and reducing, most systems will produce:—

Direct reading film positives.
Reverse reading film positives.
Direct reading film negatives.
Reverse reading film negatives.
Direct reading paper positives.
Reverse reading paper positives.
Direct reading paper negatives.
Reverse reading paper negatives.

The work can be produced by outside sources for subsequent use by the reprography department.

Typewriters: Ordinary typewriters can be used, but they do not offer a variety of type face or size. Neither do they allow for "proportional" spacing. For example, on a conventional typewriter the letter "i" occupies the same amount of space as the letter "w," although the actual width of the letters is quite different. In proportional spacing, each character occupies only the amount of space needed for it to display its natural shape. Machines can be obtained which have the characters spaced accordingly.

Impression, too, is important. Whilst a variety of ribbons are available to give good, clear, dense impressions, the electric typewriter is often used rather than a manual machine, as it ensures uniformity of impression, not possible even with the best of manual machines, or typists.



Proportional type

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Non-proportional type

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

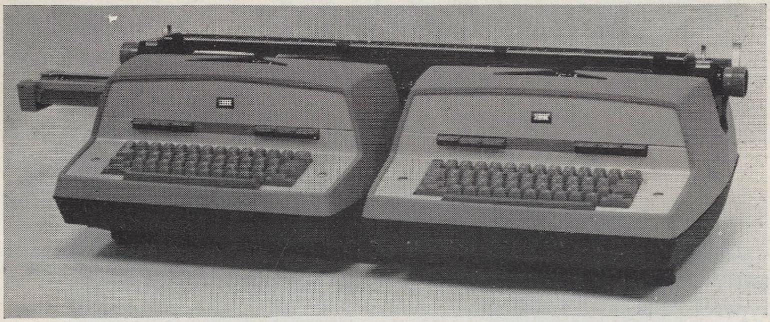
Proportional type

a b c d e f g h i j k l m n o p q r s t u v w x y z

Non-proportional type

a b c d e f g h i j k l m n o p q r s t u v w x y z

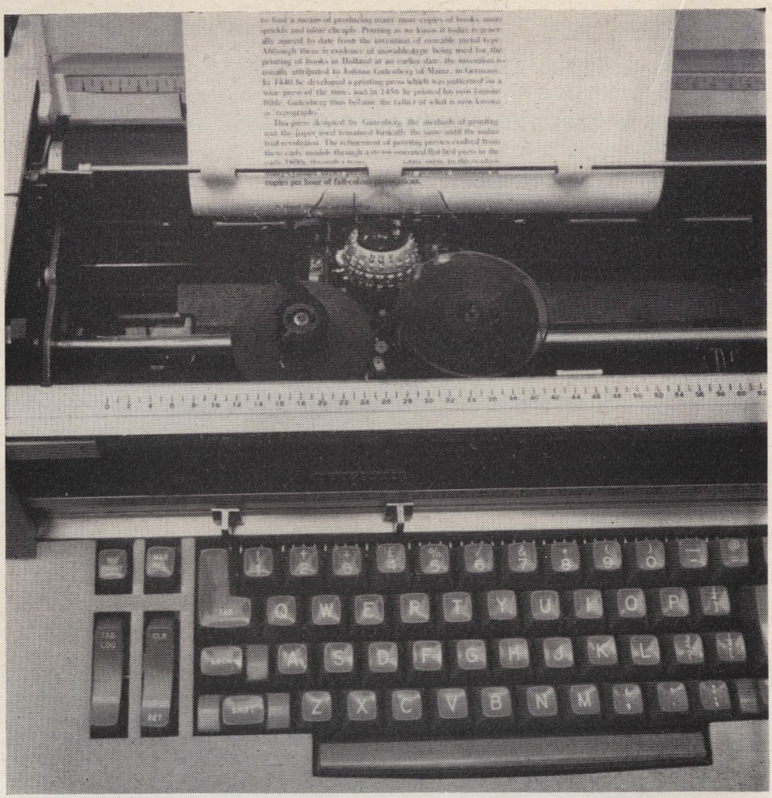
Proportional and Non-proportional Type.



"Tandem" Typewriter.

Often there is a need for type faces to be mixed in the same copy. Two machines can be employed, or a "tandem" typewriter. This has the keyboard and typing units but only one carriage. Alternatively, a typewriter is available with an interchangeable type basket; and another with segments of interchangeable type instead of the normal typebars.

For technical work, a typewriter with a "golf-ball" head is often used. These heads bear various symbols, and are interchangeable with others bearing different symbols. It is now possible to obtain heads bearing different type faces.

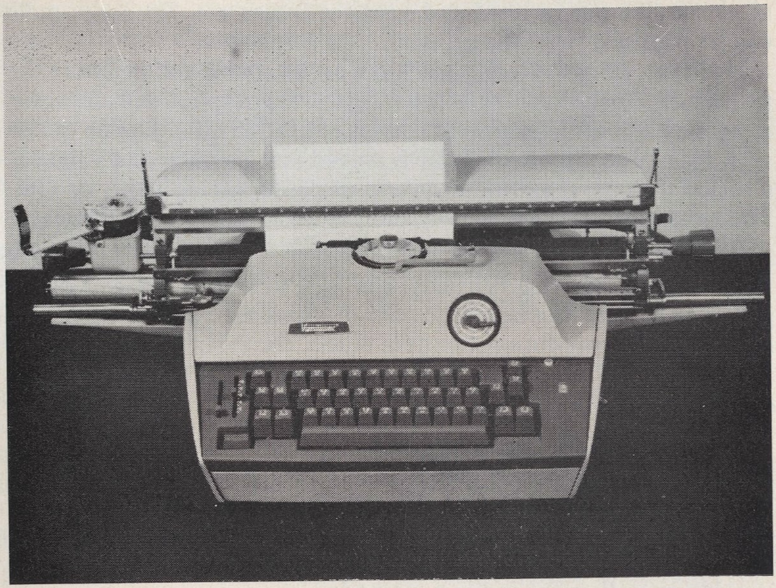


Typewriter with "Golf-ball" head.

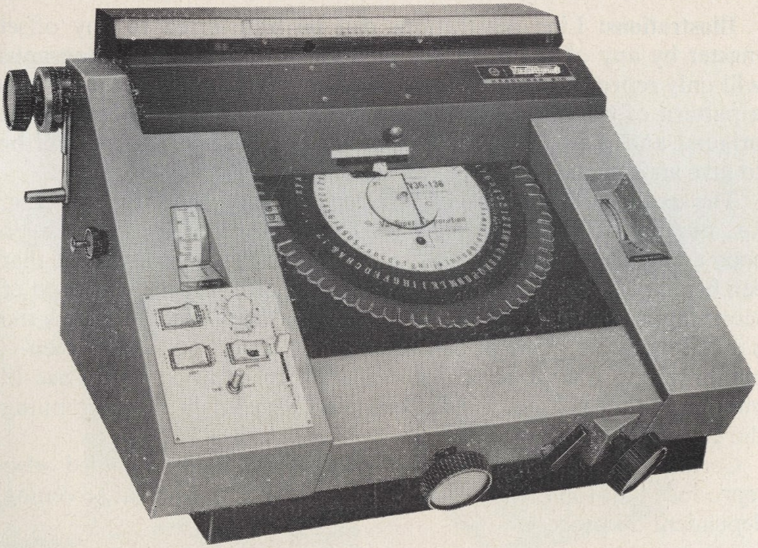
In appearance, "justification" of the text can play an important part. Comparison between the printing in this book, and a page of typescript will suffice to illustrate the difference. This can be achieved by a second typing, the first having indicated the amount by which each line must be altered. Machines can be obtained which do this either semi or fully automatically in a variety of ways.

So far none of these methods allow for a real mixture or choice of type face. This is accomplished by more complex machines on which type faces from a selection are available, and can be changed in a matter of minutes. Line justification is also incorporated on some models. An advantage with these machines is that most of the type faces are the same as those used in hot metal setting.

Headlining: The methods just described are suitable for general text copy, and wording up to 14 points in size. Ordinary sizes can be photographically enlarged. Where they are constantly required, a



A Typewriter used for Composing a Wide Range of Typefaces.



Photographic Headliner.

stock may be put in hand and kept for future use. Similarly, pulls can be obtained from the printer.

However, photo-lettering machines are available and basically the principle of operation is as follows. Letters are supplied as translucent images on a black background in clips of film, strips of film or spools —or on a large disc. Each letter is moved into position and a light is directed through it and onto a strip of photographic paper or film. The heading is then developed, and placed in position on the text.

Alternatively pressure sensitive transfer lettering can be used.

Writing and Drawing: Virtually anything written or drawn by pen, pencil, or ballpen, can be reproduced on a sensitized master. Although some colours reproduce better than others, for the best reproduction, an opaque black ink should be used. Stencils similar to those sold for drawing office work are suitable for lettering aids.

Adhesive Transfer Lettering: For quick and easy display work, this lettering is now extensively used. Shading material made in the same way may be incorporated for illustration and diagram work. It is dealt with more fully in the chapter covering Drawing Materials. Mention should be made however, that it is now available for direct imaging as well as for indirect methods.

Type Proofs: Printers type proofs can be used. When used for indirect masters they need not be pulled in reproducing ink as in the case of direct masters.

Illustrations: Line illustrations can be transferred to any offset master by any of the processes mentioned above, but photographs will only reproduce if they are screened. That is, breaking it up into a pattern of dots of varying sizes, by placing a screen between the original and the camera. The resultant effect when printed will be to give an optical illusion of half tone.

The quality of this illusion will depend upon the size of screen, *i.e.*, number of dots per square inch. The positioning of it between copy and camera is also important. A contact screen is available that can be placed directly on the film in the camera. A further method of screening is by use of a special pre-screened film which obviates the use of separate screens. It can be said to have a "built in" screen—but only one size of screen is available. In addition to its use in photographing flat originals it can also be used in photographing the subject itself.

Certain of the photo-copying processes already detailed also reproduce half tones with varying quality, with or without screening dependent on process.

Colour: The offset method is particularly suitable for colour work and many shades of ink are available already mixed. The masters for individual colours can be prepared in ways already outlined. Where two colours are involved as separate printings, this can also be accomplished without difficulty.

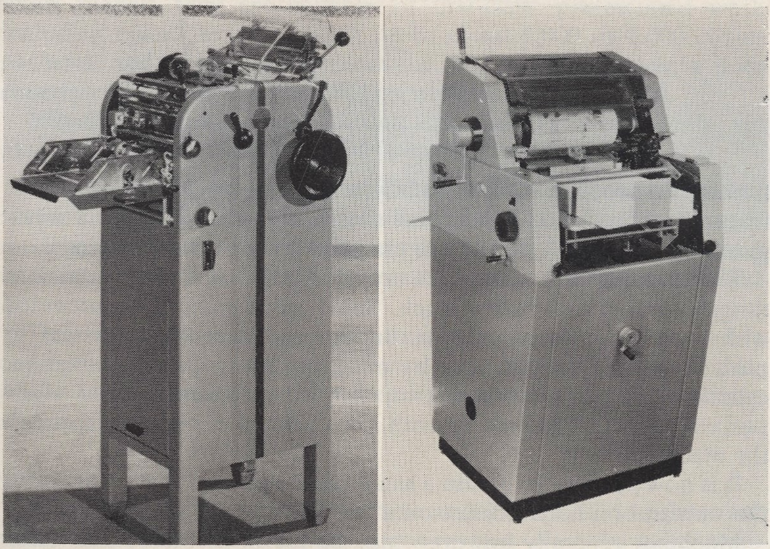
For half-tone colour work, separate sets of colour plates are necessary, made from screened colour separation negatives at the photographic stage. Offset is highly suitable for this work but its application in the office is probably limited due to cost, although it is a relative factor to the value of the end product and length of run.

Layout: Where the offset master is made by photographic or copying processes, final layout includes the cutting and pasting into correct position all the various copy required for the plate. Careful preparation at this stage will undoubtedly save work and expense at the camera and platemaking stages.

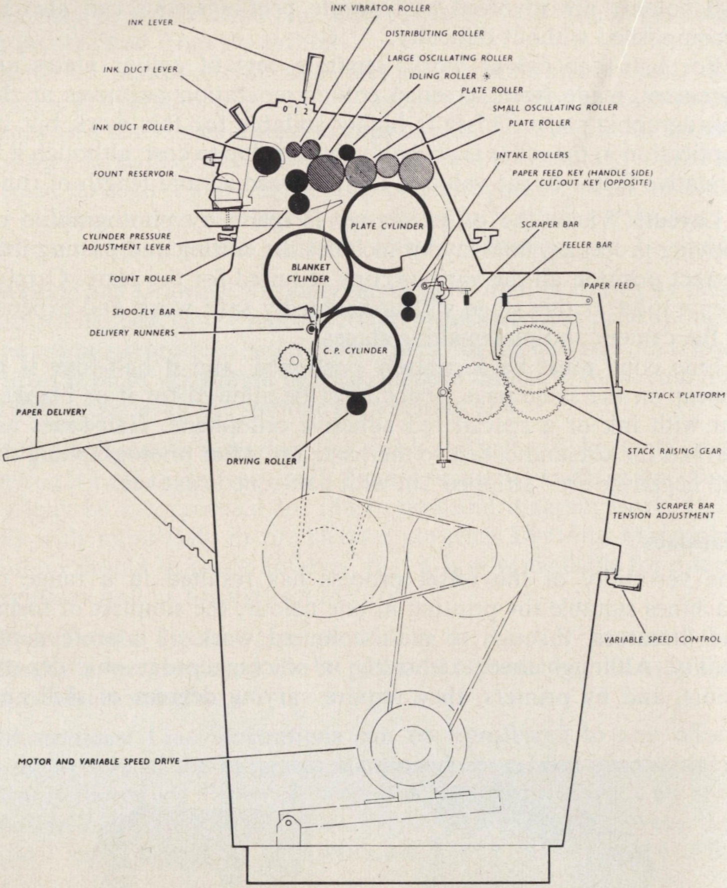
Line copy must be accurately postioned, and if half-tone is to appear on the same page, space must be allowed for it or blanked out with ink or a special red adhesive cellophane. Half-tones are marked for size and coded to the paste up. After photographing the line negatives are "stripped" in with half-tone negatives.

Machines

The versatility of the offset process has resulted in a range of machines suitable for printing in one colour, the simplest of forms and literature, through to multi-coloured work of a professional quality. Although used extensively in offices, reprographic departments, and by printers, they require varying degrees of skill and



Office Offset Duplicators.


INK VIBRATOR ROLLER
INK LEVER
DISTRIBUTING ROLLER
INK DUCT LEVER
LARGE OSCILLATING ROLLER
IDLING ROLLER ✱
PLATE ROLLER
SMALL OSCILLATING ROLLER
0 1 2
INK DUCT ROLLER
PLATE ROLLER
INTAKE ROLLERS
FOUNT RESERVOIR
PAPER FEED KEY (HANDLE SIDE)
CUT-OUT KEY (OPPOSITE)
PLATE CYLINDER
SCRAPER BAR
CYLINDER PRESSURE ADJUSTMENT LEVER
FEELER BAR
FOUNT ROLLER
BLANKET CYLINDER
PAPER FEED
SHOO-FLY BAR
DELIVERY RUNNERS
C. P. CYLINDER
STACK PLATFORM
PAPER DELIVERY
STACK RAISING GEAR
DRYING ROLLER
SCRAPER BAR TENSION ADJUSTMENT
VARIABLE SPEED CONTROL
MOTOR AND VARIABLE SPEED DRIVE

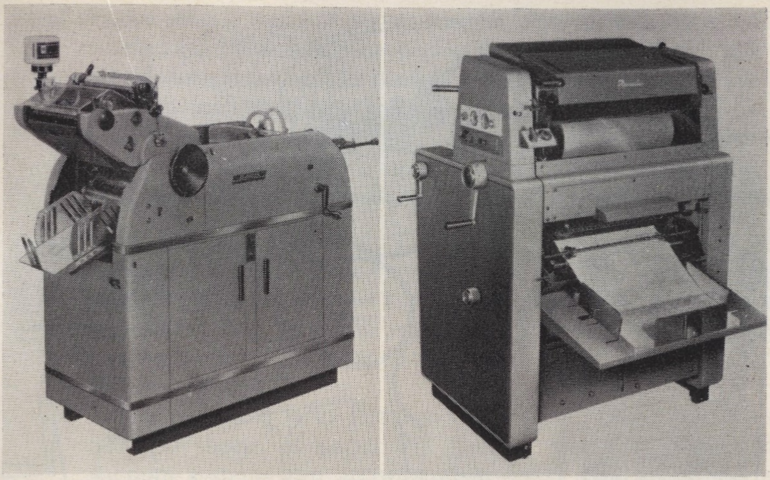
Machine diagram of typical Office Offset Duplicator.

training to produce work of satisfactory standard. Many automatic features incorporated in machine design reduce training to a minimum. Practically all manufacturers offer free operator training.

The machines are made in a variety of sizes and to print a wide range of paper and board stock. Some machines can be provided with a second master cylinder, inking, and dampening system to print in two colours at once by offsetting on to the same blanket cylinder. Others incorporate two complete printing units to allow two colours to be printed or both sides printed at one pass through the machine.

It is now possible to obtain a small offset machine that prints from the web and on both sides at once.

Machines generally however, may be classified briefly into three principal groups.



In-plant Offset Machines.

Office Machines: These are the simplest and least expensive for use in the office by trained staff. They may be either table or floor standing and can print up to about 5,000 copies per hour, usually up to foolscap size, although some will take up to brief size.

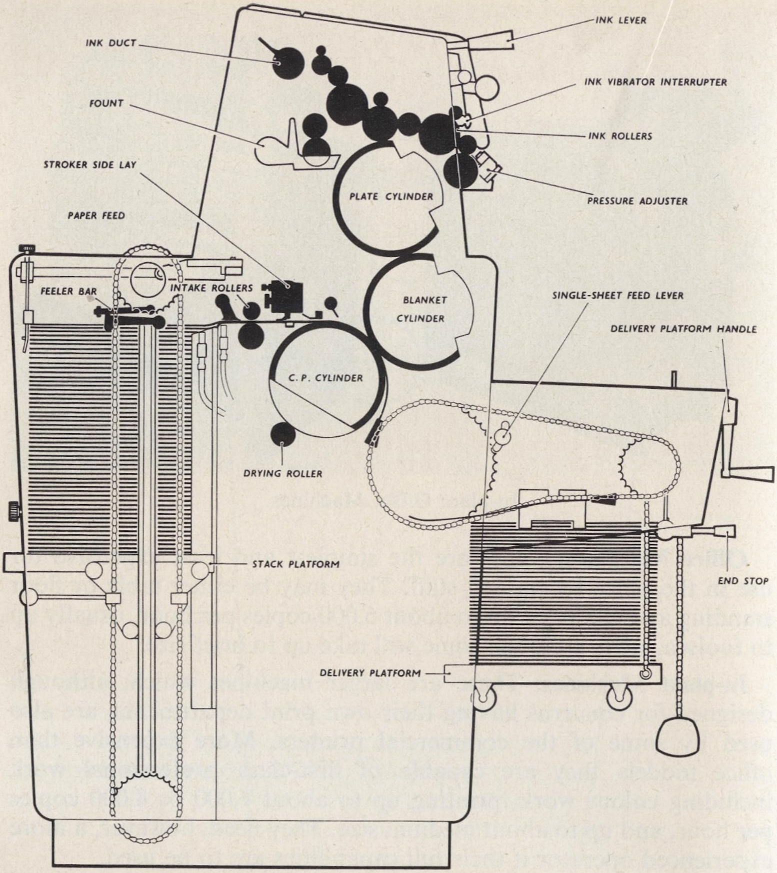
In-plant Machines: These are larger machines which, although designed for concerns having their own print departments, are also used by some of the commercial printers. More expensive than office models they are capable of first-class professional work including colour work, printing up to about 7,000 or 8,000 copies per hour, and up to about medium size. They need, however, a more experienced operator if their full capabilities are to be used.

Numbering, perforating, slitting and scoring attachments are available for most machines of this type.

Systems Machines: These are fairly complex in construction but simple to operate. They are generally referred to as "quick change" models. On these the print cycle has been largely, and in some cases completely automated, and paper masters can be changed in a matter of seconds.

They are employed for documentation work, where as few as five copies only are required from each master, and are primarily intended, as the name implies, to print forms which are part of a business system.

In addition to the type of machine and its capabilities, there are many other aspects of machine design that must be taken into account. However, the diversity of the range and limited space,


INK DUCT
FOUNT
STROKER SIDE LAY
PAPER FEED
FEELER BAR
INTAKE ROLLERS
INK LEVER
INK VIBRATOR INTERRUPTER
INK ROLLERS
PRESSURE ADJUSTER
PLATE CYLINDER
BLANKET CYLINDER
C. P. CYLINDER
DRYING ROLLER
SINGLE-SHEET FEED LEVER
DELIVERY PLATFORM HANDLE
STACK PLATFORM
END STOP
DELIVERY PLATFORM

Machine diagram of typical In-plant Offset Machines.

precludes a detailed survey. It is only possible to give a very brief summary of the basic features affecting choice and price; and this only in respect of the less expensive machines. Even so, the price range extends from several hundred to several thousand pounds. It is therefore essential that expert advice and opinion is sought when an installation is under consideration.

(1) Power. All machines are power driven. Master and blanket cylinders can be manually rotated to facilitate fixing of the master and cleaning of the blanket.

(2) Plate size. The average plate size on smaller machines is about 10 in. × 15 in. extending to 15 in. × 20 in. Larger machines take plates up to 24 in. × $28\frac{1}{2}$ in. Maximum print areas are just short of these sizes.

(3) Paper. Most kinds of paper can be printed by offset. The smaller machines can print papers from 45 g.s.m. bank up to 3 or 4 sheet board, while the larger models will accommodate from air mail weight up to 6 or 8 sheet board.

Most of the smaller and medium size machines can take a paper size from 3 in. × 5 in. up to the maximum.

Larger machines from about 8 in. × 11 in. to the maximum.

(4) Feed and paper control. Feeding is by either friction or vacuum systems. Friction systems are usually found in the smaller machines and do not allow registration to precision standards; they may also restrict the variety of papers that can be used. Both restrictions are obviated with vacuum systems.

The feed pile with friction systems only accommodates 500–750 sheets of paper (73 g.s.m.), whereas, that with vacuum systems can accommodate 5,000 sheets and sometimes more.

Most machines are fitted with sheet counters and devices to detect double feeding.

Delivery of the printed sheets is aided by guide runners or a chain gripper mechanism to a delivery pile taking up to 500–1,000 sheets in most small and medium machines, and 5,000 or more in the larger.

(5) Inking and dampening systems. According to make these vary considerably. Ink and fluid may be fed through separate systems or both fluids combined in a single system. In another system, the ink controls the amount of dampening fluid.

Offset printing inks are basically similar to standard litho inks and available in a vast range of colours. Some papers, such as art or imitation art with a glossy surface, require a fast drying ink or anti-set-off spray, to prevent the image setting-off on the underside of the following sheet.

The dampening fluid is either distilled water or a specially treated water called a "fountain" solution. These vary with different types of master.

To ensure trouble free operation by those who are not fully trained printers, most manufacturers supply grades of ink and fluids specially formulated for their machines.

The inking system requires cleaning periodically or for changing colour. Likewise the blanket cylinder also requires cleaning before printing a new image.

(6) Print Control. The impression cylinder can be adjusted by various means to facilitate the feeding of different thicknesses of paper or card stock and to control print impression.

Image position on the paper can be controlled by adjustment of the plate to close limits on the plate cylinder. Adjustments can also be made to the paper feed system. Complete accuracy or "hairline" registration is possible with vacuum feed systems—very important for colour work. Friction feeding only allows registration to 1/32nd of an inch.

(7) Speed. Office machines operate at 2,500–5,000 impressions per hour. Larger machines up to 6,000 i.p.h. or more. With colour work, speeds are slower dependent upon the ink distribution system, registration required, etc. (Small web-fed machines operate up to 25,000 i.p.h. with single colour work.)

(8) Machine features and attachments. Particular features of machine design and the numerous attachments available, vary greatly between manufacturers. They also vary from model to model. With some machines the controls and operation may be partly manual, while others are fully automatic. Features that are standard on one machine may be catered for in another by optional extras, or the availability of attachments.

Examples include such items as ink and blanket roller cleaning units, paper feed and delivery devices, pre-set counters, anti-set-off units, numbering, signature, slitting, perforating and scoring units, etc.

Machines designed for systems application are less suitable for general printing, although certain machines have been designed for dual purpose use.

13. Future of Reprographic Processes

This section can do no more than project the processes already described, towards the anticipated needs of the businessmen of the future. Without detailed knowledge of the research and developments currently being studied in the laboratories of the world, one cannot anticipate what new reprographic processes are likely to be invented. Those that do emerge, will only do so if they can be used in the business context and prove lucrative to their sponsors.

The key to future processes is the study of future requirements rather than the study of the direction in which science is going. Scientific discoveries of themselves are of only academic interest until we have a need to use them. The needs of business have become the spur to invent. Inventions become a useful reality only when they provide a commercial and financial return on the investment in that invention. The diazo process, for example, was known scientifically in 1875, but did not emerge as a reprographic process until about 1921. In more recent times, the oil vaporization process was known as a laboratory curiosity for many years, before a machine using the process was built. Although many hundreds of thousands of pounds was spent on its development, it never emerged as a commercial proposition.

It was noted in the section dealing with visual communications that some 40,000 million pieces of paper will be circulated during the next twelve months in business circles. Bearing in mind this bulk of paperwork, and the increasing volume of paper that business seems to need to lubricate its functional effect, miniaturization to a limited degree at least seems inevitable. Unless this happens the cost of the transmission of information is likely to increase exponentionally, and ultimately, businessmen will be seen to be floating on a sea of filing cabinets.

It can be anticipated therefore, that machines are likely to be developed to handle a lighter weight of paper so that the transmission costs can be reduced. Another direction in which developments can be envisaged, is through the reduction to about one-third of the conventional size of imaged paper. In this way more information can be transmitted at a lower cost of both the paper and the postal charges and at the same time the storage costs of essential documents can also be reduced to a third.

This trend towards increasing the information content on standard documents has already been noted in the typewriter field. Elite type faces have become available after pica type faces were well established. This was the first step towards partial miniaturization, and resulted in the page content of information and date being increased. Surprisingly enough it is no hardship to read a foolscap page of normal type when it is reduced to 50 per cent. lineally which is the equivalent of a reduction to a quarter of its original area. When documents are reduced to a third of the original size, the savings in transmission costs, paper and storage space will be very significant. The necessary technology to do this is available today.

In time, the physical transmission of paper carrying images may be eliminated. By giving the imagination free reign it can be envisaged that a document containing information and data will be typed conventionally at point A, then reduced, transmitted by the already established telephone network and reproduced in either full or reduced size at point B in legible form.

It is quite obvious that business, as we know it, cannot and will not be able to function without the flow of information and data, in visual communication form, through its veins. It follows therefore that reprographic developments will be in the direction of greater copying speeds, smaller formats with increased content, easier methods of distribution of these visual communications, and lower costs per copy.

Technical developments in the diazo field, now make it possible to extend this hitherto same size method of copying, to enable enlargements and reductions to be accomplished. The first applications of this new facility, are to be found in the drawing offices of industry. Engineering drawings which, for ease of storage and quick retrieval, can be reduced to microfilm and subsequently enlarged onto diazo paper for easy readability. This method of handling engineering drawings was made possible by the xerographic process where these microfilm drawings could be enlarged on to plain unsensitized paper up to 24 in. wide and of any length. This has been possible xerographically since 1960.

Although these methods are at present confined to industrial drawing office reprographic problems, it can be anticipated that similar and possibly modified versions of these equipments will appear in offices in due course. There are no technical difficulties in producing copying machines that could handle an input of 35 mm. or 16 mm. microfiled images in unitized punched-card format. It is doubtful, however, that businessmen will accept for ordinary correspondence, the delays implicit in the reduction down to 16 mm. or 35 mm. film, its processing, the mounting of these films on the punch cards AND the subsequent enlargement required for readability before the communication can be understood and action taken.

It is, however, probable that partial miniaturization of documents to a third of their original size, which will not entail film processing, card mounting and subsequent enlargement, will be accepted. Minor developments in the pure duplicating field can be expected which will result in duplicating machines becoming more efficient and sophisticated, but no brand new ways of creating visual communications in quantity seem to be envisaged by those enaged in this field.

The xerographic breakthrough, which enabled ordinary office stationery to carry all the necessary visual communications used in business, with its reduction and enlargement capability and its high speed potential of about 3,600 copies per hour, will play a major part in the impending paperwork revolution in the offices of the world.

The revolution, however, is expected to be an organizational one rather than one involving entirely new processes.

Businessmen are likely to demand more extensive and more convenient combinations of the sciences behind the processes we already know, in order to make the business of communicating visually, cheaper, easier, and faster.

14. British Standards

There are a number of British Standards published that relate to certain sections of this chapter. Principally they concern sizes of photographic accessories, materials, etc. Undoubtedly of importance to those directly concerned, inclusion of them either in full or in part, is not considered necessary for the purpose of this chapter, with the exception of the standard covering sizes of sensitized materials for document reproduction; this is included in its entirety. Sizes of non-sensitized papers have been dealt with elsewhere.

British Standard Sizes of Sensitized Materials for Document Reproduction (1960)

This British Standard was first published under the authority of the Photographic Industry Standards Committee in 1952 as a series of Recommendations to give guidance regarding sensitized materials, other than film, for document reproduction.

The present revision is published not as a series of Recommendations but as a Standard and takes into consideration newer forms of materials for document reproduction, *e.g.*, heat sensitive and electrostatic materials, and also certain photographic film formerly excluded from earlier editions of this Standard. Particular attention is drawn to the proposed ISO sizes A0—A5 for cut sheets, and it is recommended that these should be used wherever possible.

Scope

This British Standard specifies

(*a*) the types of sensitized materials used in document reproduction,
(*b*) the sizes of cut sheets,
(*c*) the widths and lengths of material in roll form,
(*d*) tolerances on sizes,
(*e*) marking of packages.

Types of Sensitized Materials

The types of materials covered by this British Standard for document reproduction purposes are tabulated as follows:

(*a*) photographic contact materials,
(*b*) photographic projection blue-sensitive materials,
(*c*) photographic projection orthochromatic materials,
(*d*) transfer materials.
(*e*) heat-sensitive materials,
(*f*) electrostatic materials,
(*g*) diazotype (dye-line) materials,
(*h*) ferro-prussiate materials,
(*j*) light-sensitive electro-conductive materials (in roll form only).

Definition

Prime sizes are those by which the material is catalogued and ordered.

Dimensions and Tolerances

(*a*) The actual cutting sizes of the sensitized materials are those shown as prime sizes (in heavy type) and shall conform to the dimensions given in the tables as follows:

Sheet material	Table 1.
Roll material	Table 2.

(*b*) The tolerances on the actual cutting sizes are as follows:

	Dimension		Tolerance
Sheet material ..	Up to and including 8 in. ..		$\pm \frac{1}{32}$ in.
	Over 8 in.		$\pm \frac{1}{16}$ in.
	Up to and including 20 cm.		$\pm$ 1 mm.
	Over 20 cm.		$\pm$ 1·5 mm.
Roll material ..	Width	inches ..	$+ 0, - \frac{1}{16}$ in.
		metric ..	$+ 0, -$ 1·5 mm.

Squareness of Cut Sheet

Neither diagonal of any sheet of material shall exceed the diagonal of a rectangular sheet of the appropriate maximum cutting length and width, nor shall it be less than the diagonal of a rectangular sheet of the appropriate minimum length and width.

Basis of Size Checking

Any check of dimensions shall be made on unprocessed material taken from a previously unopened package and examined at once at a temperature and humidity not differing significantly from 20°C. and 65 per cent. relative humidity.

Size References

The practice in the photographic industry and in the paper and stationery industries is to give first the prime size, followed by the equivalent nominal size in the alternative system of measurement. The smaller dimension in each size shall be given before the larger.

Example: 8 × 10 in. (20·3 × 25·4 cm.).

This method of size reference facilitates the listing of both inch and metric sizes in sequence and follows Continental, American and Canadian practice.

Marking of Packages

(*a*) Each package of material shall be marked with the type of material and the size of the material contained in it shown in inch or metric measurements, or in both. In the case of cut sheets the smaller dimension shall be shown first.

(*b*) When it is desired to mark packaged material to indicate conformity with this standard the following wording shall be used:

"Conforming to B.S. (and the number)."

Table 1. Sizes of Cut Sheets

(types *a—h* Types of sensitized materials)

The prime sizes are shown in heavy type

in.	cm.
5⅞ × 8¼	**14·8** × **21·0** (size A5)*
6½ × **8½**	16·5 × 21·6
8 × **10**	20·3 × 25·4
8 × **13**	20·3 × 33·0
8¼ × 11¾	**21·0** × **29·7** (size A4)*
8½ × **11**	21·6 × 27·9
8½ × **14**	21·6 × 35·6
9 × **14**	23·0 × 35·6
10 × **12**	25·4 × 30·5
10 × **13**	25·4 × 33·0
10 × **15**	25·4 × 38·1
10 × **16**	25·4 × 40·6
11¾ × 16½	**29·7** × **42·0** (size A3)*
12 × **15**	30·5 × 38·1
13 × **16**	33·0 × 40·6
13½ × **20**	34·3 × 50·8
14 × **18**	35·6 × 45·7
15 × **20**	38·1 × 50·8
16 × **20**	**40·0** × **50·0** (see Note 2)
16½ × 23⅜	**42·0** × **59·4** (size A2)*
20 × **27**	50·8 × 68·6
20 × **30**	50·8 × 76·2
22 × **30**	55·9 × 76·2
23⅜ × 33⅛	**59·4** × **84·1** (size A1)*
27 × **40**	68·6 × 101·6
30 × **40**	76·2 × 101·6
33⅛ × 46⅞	**84·1** × **118·9** size A0)*

The following are primarily used for index cards and are finished sizes:

3 × 5	**7·5** × **12·5**
4 × **6**	10·2 × 15·2
5 × **8**	12·7 × 20·3

*B.S. "Printed matter and stationery. A and B series of trimmed sizes."

NOTE 1. The inch or centimetre equivalents of the prime sizes, known as the nominal sizes, are quoted to the nearest ⅛ in. or 0·1 cm. as appropriate.

NOTE 2. Actual cutting sizes are the same as the prime sizes shown in heavy type. In the case of the 16 × 20 in. (40 × 50 cm.) the cutting size for both these prime sizes is 16 × 20 in.

NOTE 3. Paper larger than 33⅛ × 46⅞ in. is used but is normally cut from materials supplied in roll form.

NOTE 4. Not all the sizes of cut sheets given in Table 1 are necessarily available in all types of sensitized materials enumerated in types of sensitized materials.

Table 2. Widths and Lengths of Rolls

Type of Material	Widths												Lengths												Prime Length
													yd.								10	20	50	450	
	* in.	8	9¼	10	11½	13	13¾	16	18	20	30	40	ft.	33	66	132	175	250	350	600					
	cm.	20·3	23·5	25·4	29·2	33·0	34·7	40·6	45·7	50·8	76·2	101·6	m.	10	20	40	53	76	107	183					
(*a*) PHOTOGRAPHIC CONTACT																									
Papers		×	×		×	×		×		×	×	×			×	×									m.
Other materials											×	×		×	×										m.
(*b*) PHOTOGRAPHIC PROJECTION (BLUE-SENSITIVE)																									
Papers for use in continuous machines									×								×								ft.
Other papers										×	×	×			×	×									m.
Other materials											×	×		×	×										m.
(*c*) PHOTOGRAPHIC PROJECTION (ORTHOCHROMATIC)																									
Papers for use in continuous machines					×		×		×								×		×						ft.
Other papers											×	×			×	×									m.
(*d*) TRANSFER	Rolls not normally supplied																								
(*e*) HEAT-SENSITIVE		×																		×					ft.
(*f*) ELECTROSTATIC	Rolls not normally supplied																								
(*g*) DIAZOTYPE (DYE-LINE)											×	×									×	×	×		yd.
Materials for general use		×		×																				×	yd.
Materials for general use											×	×									×	×	×		yd.
(*h*) FERRO-PRUSSIATE (BLUE PRINT)											×	×									×	×	×		yd.
(*j*) LIGHT-SENSITIVE ELECTRO-CONDUCTIVE		×																×							ft.

* The inch widths are the prime sizes

CHAPTER 24

Reproduction Process Ancillary Equipment

The reproduction processes dealt with in the preceding chapter are now firmly established in many large industrial and commercial concerns. Progress is such that the introduction and use of one piece of equipment inevitably lead to the need for further equipment to deal with other operations. Again, technical advances enable some methods of production to be handled by comparatively unskilled operators, although some initial training is of course necessary. Economic considerations also, determine the use of equipment that not very long ago was used only by "trade" sources. The very large company now has its own "print room," and installs not only reproduction equipment but subsidiary and ancillary items that enable the complete production to be carried out. Much of this equipment is handled only by specialist companies, and often it is sold direct to the user. In consequence it will not be dealt with in very great detail. However, superficial knowledge of availability and function is without doubt essential, if only for the understanding of current trends.

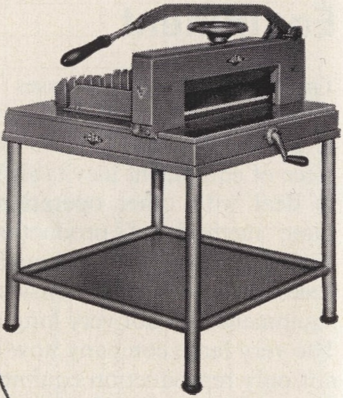
1. Guillotines

The basic difference between paper trimmers or cutters (which have been dealt with in Part I of this book) and guillotines is that the latter are designed to cut and trim much greater quantities of paper, and to do so to hair-line accuracy. To achieve this the action of a guillotine must be a diagonal slicing action down and through the paper pile by a single blade, which comes to rest on a "cutting stick." This stick is usually of plastic material. Because the guillotine will cut by the ream, it is the most economical instrument for the printing and duplicating room.

Hand-operated

The modern hand-operated guillotine has a lever arm action and the paper is held rigidly in position by a clamp. Most clamps are operated by a wheel, and they interlock with the back gauge so that even quite narrow strips of paper can be clamped and cut (*e.g.*, label cutting). The paper is brought to the required position for cutting by placing it on the paper table against the back gauge. The gauge can then be moved forwards or backwards along the table against a scale marked in inches and centimetres.

The lever arm action enables the user to cut through a ream of paper with comparative ease: complete safety is ensured by guards at both the front and rear of the blade. The lever itself is also fitted with a safety catch.



Hand Operated, Lever Arm action Guillotine.

Power Operated Guillotine.

Power-operated

Compact power-operated guillotines work on much the same principle, and are particularly useful for the busier duplicating room. The blade is driven by a $\frac{1}{2}$ or 1 h.p. motor, according to the maximum cutting length of the machine. Up to two reams of paper, even from flat sizes, can be cut in five seconds. Because there is no physical effort involved this type of guillotine is suitable for use by female staff. No operational skill is required, and front and rear guards are linked with the motor to ensure that a cut cannot be made unless both guards are in the locked position.

Sizes

Both hand and power-operated guillotines are available in 14 in., 18 in. and 20$\frac{1}{2}$ in. cutting sizes to deal with quarto, foolscap, crown, royal, large post and double cap paper sizes. The cutting capacity of these machines will range from 1$\frac{1}{2}$ to 3$\frac{1}{8}$ in. thickness of paper and card stock.

It must be remembered that the onus is on the user to provide adequate safeguards against accidents resulting from careless handling (Offices, Shops and Railway Premises Act 1963, and the Dangerous Machinery Order 1964.)

2. Collators

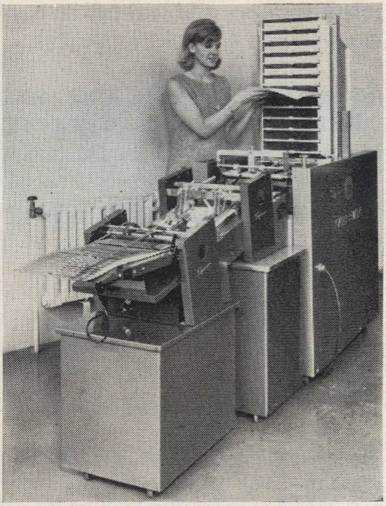
The collating of sheets means gathering them together in the right order as, for example, with the pages of a book. Although hand collating is still carried out, a range of machines is available which enable the work to be carried out more speedily and economically. There are two main groups.

Semi-Automatic Machines

The sheets are housed in individual troughs, the number of which varies according to make and size of machine. Usually they range in number from 6 to 24. By depressing a foot pedal or pulling a lever, the operator applies a "thrusting" mechanism to the sheets in each trough. This causes the top sheet to be thrust forward, either vertically or horizontally according to model. These sheets are then gathered up by hand to form a "set," and the process is repeated as many times as the number of sets required.

The number of sets collatable from one loading of the troughs varies from 250 to 400. Most machines take paper from air mail thickness up to thin card. They can also collate mixed thicknesses of paper and sizes.

Six Station, Electric Semi-Automatic Collator.



General Purpose Fully Automatic Collator with Folding and Stitching Unit.

Similar machines can be operated by a power-operated foot pedal or by means of push buttons.

Joggers: Where semi-automatic manual or power-operated collators are used, paper joggers can be a useful additional item of equipment. These are vibrating tables, either desk top or floor standing models, which "knock-up" the paper squarely after it has been collated into sets. By placing sets criss-cross in the jogger, the operator can maintain set separation.

Fully-Automatic Machines

These are more complex machines than the former. The sheets are pushed by feeder heads from a series of "stations." This is known as *friction feeding*. They are then gathered together in the correct order and finally deposited in a receiving tray, in which they are "jogged" and off-set stacked.

The machines can also be operated by the *suction feed* principle. These machines are used mainly in the collating of stationery sets including carbon inserts and handbooks of coated papers, which cannot be dealt with by friction feed collators.

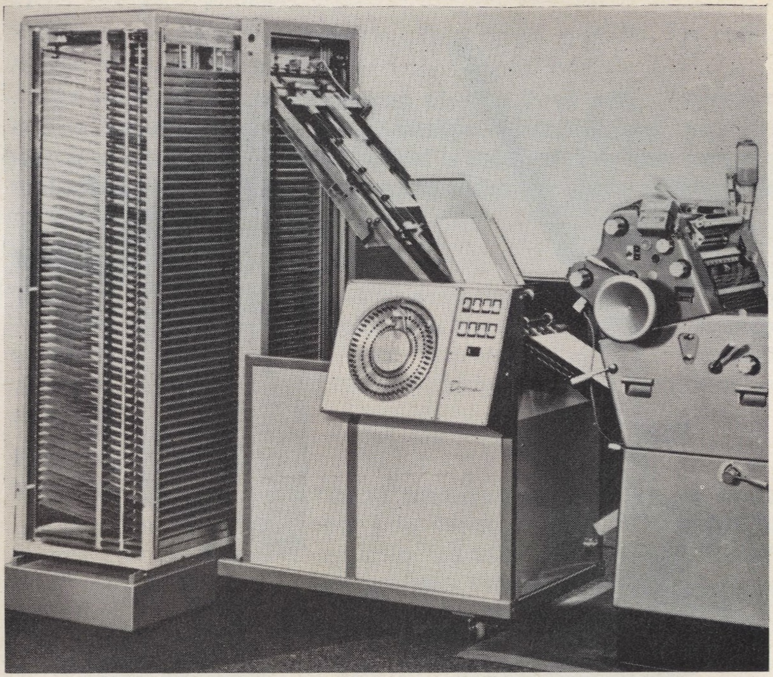
The collating mechanism varies, but most machines can handle a wide variety of paper and board thicknesses, and are adjustable for size. Some types can collate folded sheets. Additional features include automatic set separation, counting mechanisms, miss-feed or faulty set detectors, folding attachments and saddle stitching units. Some types are also suitable for collating material, inserting it into envelopes and sealing the flaps. Reference to these is made in the chapter on Mailing Equipment.

Sorters: For short run work, such as research reports, management information and computer print outs, a special type of collator, known as a "sorter", is attached to the small offset printing machine. These sorters accept each sheet of paper as it is printed and deliver it to a separate station. As successive sheets are printed they are added to the earlier sheets in each station.

Most of the fully-automatic machinery involves expenditure of considerable proportions, but the semi-automatic types are less expensive and are often sufficient for the office print room.

3. Punching, Drilling and Stapling Machines

The smaller varieties are dealt with in Part I of this book, but heavier-duty models are often more suitable for the modern office print room, particularly where speed of output is important. Furthermore, although the smaller models have their uses, they are not made to fulfil the same needs as their larger brothers.



Sorter Working Direct from Small Offset, Routing Each Sheet to Separate Stations.

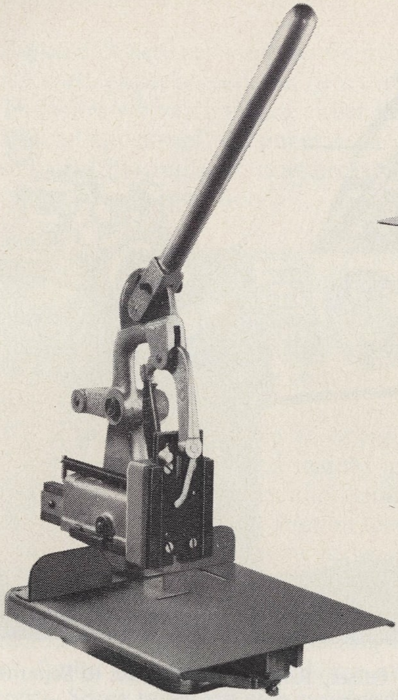
Multi-Purpose Punching Machines

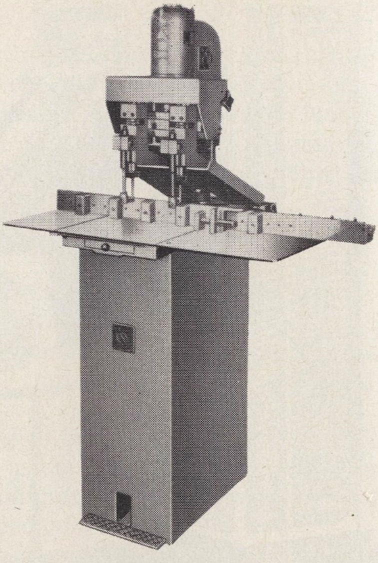
These are supplied in various working widths and can be fitted with a wide range of tools for punching paper, cardboard, plastics, etc. They are mostly hand-fed with pre-cut sheets.

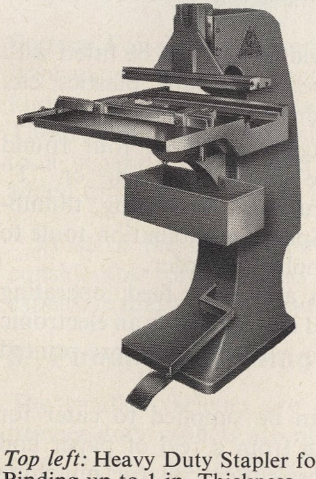
Standard tools are available for single, double or four round cornering, single, double or multi-hole punching, thong or "T" slotting, perforating, creasing, corner cutting, tab cutting, thumb-hole cutting, hand-hole punching, etc. Special combination tools to meet individual requirements can be supplied to order.

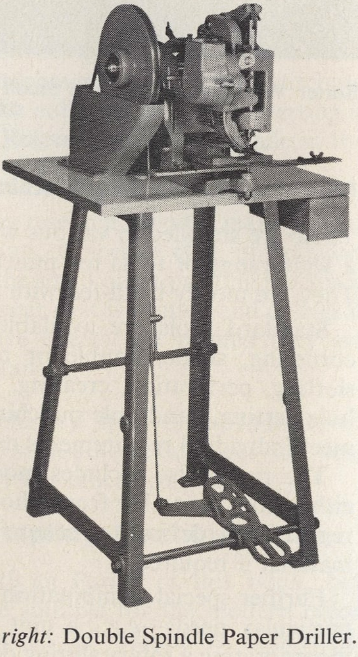
The range also includes models with automatic feed, operating either from the reel or from a hopper, and incorporating an electronic registration device to ensure accurate punching of pre-printed material if required.

Further special combination units can be supplied to cater for particular needs—*e.g.*, a unit operating from a reel of paper and incorporating a rotary slitting device, cross-cutter, collator, punching head and delivery stacker. These latter machines are normally used only by the printing and manufacturing stationery houses.









Top left: Heavy Duty Stapler for Binding up to 1 in. Thickness. *Top right:* Double Spindle Paper Driller. *Bottom left:* Multi-Purpose Punching Machine. *Bottom right:* Automatic Eyeletter.

Paper Drilling Machines

These are supplied with one, two, four or six spindles, for hand, treadle or motorized operation.

The single-spindle machines can also be fitted with cutters for corner rounding, thumb-holing, straight cornering, etc., and are therefore ideal when a limited output is required. For long runs the motorized versions are to be recommended, as operator fatigue is reduced to a minimum.

Stapling and Stitching Machines

These are available for heavy-duty work, operated by hand, treadle or motor. The heavy-duty stapling machines are used for binding up to one inch of paper with pre-formed staples. For greater thicknesses of paper, an automatic stitcher, working from a coil of wire, is necessary.

Eyeletting Machines

These, too, are available for hand, treadle or power operation. Most models incorporate a hopper into which a supply of eyelets is poured and these are automatically fed to the closing dies. Special machines can be supplied to insert two, three or four eyelets in one operation.

4. Document Binding Equipment

Many commercial and government organizations are finding a greater need to bind literature in a book form on their own premises. This particularly applies to such publications as catalogues, sales literature, price lists, company procedures and internal reports.

There are two principle methods of document binding equipment, not to mention the many devices available for securing quantities of loose sheets.

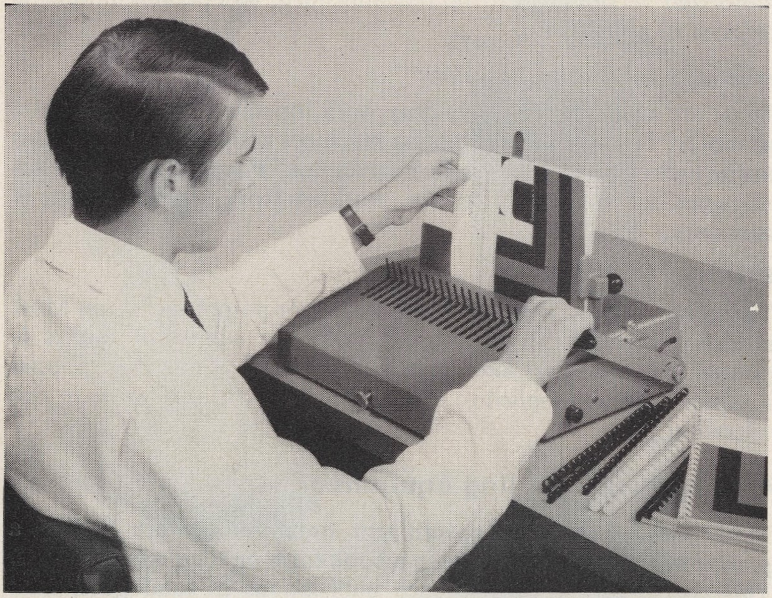
Plastic Comb Binding

This equipment allows literature to be bound without the use of stapling or adhesives and the bound book will open flat for ease of reading.

The simplest method of binding is with the use of a separate punching machine which allows approximately 12 sheets to be punched with rectangular holes along the binding edge in one operation. A plastic comb is then placed on the binding machine and by the operation of a lever the comb teeth are opened to allow the sheets to be placed on the comb. When the punched sheets are inserted on the comb, the teeth are closed by returning the lever to its original position and the bound book is removed, making an "open flat" book.

Equipment: A large selection of equipment is available to take various paper sizes, but most machines take a minimum binding length of 13 in.

Hand equipment is available as separate punch and binding machines, but the most popular method is the combined hand and binding machine, which is no larger than a standard typewriter.



A Combined Punching and Binding Machine.

The combined machine has a number of useful features to make a perfect binding, such as:

(*a*) a gauge to vary the distance of punching from the edge of paper;

(*b*) various diameter binding elements that can be opened without pre-adjustment;

(*c*) an arrangement for the removal of individual punches by thumb screws.

Electric power-driven equipment for punching up to 20½ in. in length is available for the large user, as well as foot-operated binding machinery with a working width of 16½ in.

Plastic combs are available in two types:

(*a*) *Fixed back*, which is the standard type for normal binding;

(*b*) *Slide back*, which allows the book to be used in a loose leaf form and for extra pages to be inserted by the user after the book has been bound.

The plastic combs are made in a variety of colours; the standard diameters are $\frac{1}{4}$ in., $\frac{3}{8}$ in., $\frac{1}{2}$ in., $\frac{5}{8}$ in. and $\frac{3}{4}$ in., and elements should be $\frac{1}{16}$ in. greater than the thickness of binding contents. The elements can be supplied in standard lengths up to 13 in. Longer lengths are obtainable to special order. The spine of the elements can be blocked or silk screen printed.

Most equipment manufacturers can supply a range of covers in a selection of boards or P.V.C. coverings which can be printed and blocked to customers' requirements.

Glue Binding

The sheets are squared up and clamped into a machine and a special glue is applied to the binding edge. The glue is then hardened by a built-in infra-red heater and the binding is complete after a few minutes. This method is slower than plastic comb binding, but up to 4 in. of paper can be bound in one operation and greater binding edge lengths from 16$\frac{1}{2}$ in. to 23$\frac{1}{2}$ in. can be accommodated.

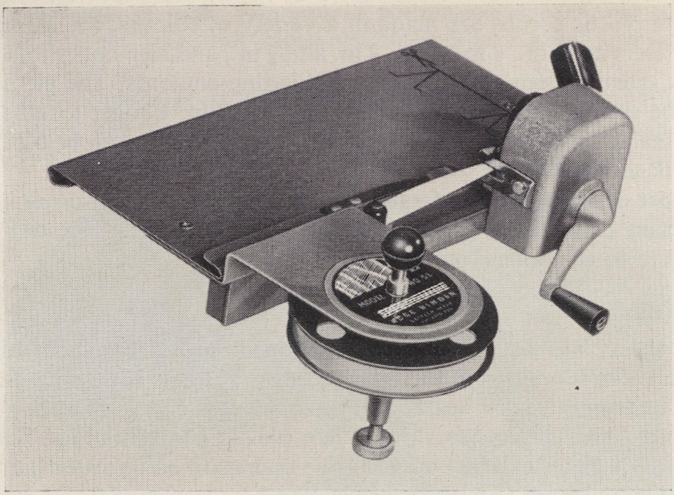
Edge-binding Machines and Tapes

Plans, drawings, specifications and the like are very expensive to produce in original form. Because of this, they need to be protected from being torn and damaged while being handled, particularly at the stage of being copied by whatever method of reproduction is chosen. Again, such documents can become torn easily when taken into the open by architects, site engineers, surveyors, etc.

The edges and corners are particularly vulnerable to accidental tearing and creasing. To prevent such damage, wherever documents that are so expensive to produce are involved, there is a need for an edge-binding machine.

Machines: These are designed to apply the chosen type of special self-adhesive tapes along and around the edges of documents without causing distortion or buckling. The appliance is normally affixed to a table or desk by a simple clamp. The document is then fed through the machine by the turning of a handle. The tape is applied evenly and accurately along each side of the document, and then cut off at each corner by means of a special attachment. Generally, the overlap of the tape is even on both the front and back of the document, but this can be adjusted by means of another adjustment screw provided. Although sometimes used to bind two or more documents together, edge-binding machines are *not* intended for this purpose.

Edge-Binding Tapes: These are available in various forms, the most popular of which are paper, cloth and plastic, all self-adhesive, and in a variety of colours. Different colours are often used for quick identification and coding when documents are stored in quantity within special drawers or cabinets.



Edge Binding Machine.

As original drawings, plans, specifications, etc., often have to be put through various types of copying machines, some involving heat processes, it is particularly important that the adhesive does not run or ooze. To guard against this, at least one type of plastic tape is available on which the adhesive is applied in two parallel strips, rather than as an overall coating. This means that the adhesive does not extend quite to either edge of the tape, and the middle portion (where the crease will be) is also left uncoated. As a result, any tendency for the adhesive to run or ooze is checked to within the area covered by the tape itself.

The most popular widths in use are $\frac{3}{8}$ in. and $\frac{1}{2}$ in., but wider tapes are available. However, the machines needed to handle widths beyond $\frac{1}{2}$ in. are necessarily larger and much more expensive.

5. Film Laminators

Lamination of transparent plastic film to the surface of printed paper, board and display matter is becoming increasingly popular.

There are two main reasons why paper is laminated:—

(1) To protect;

(2) To enhance the appearance.

There is probably an element of each in the justification for laminating any job, but they can be considered separately in examining some of the items particularly suited to lamination.

Protecting generally means giving extra strength, keeping the surface clean, improving legibility, preventing oil and water absorption, and generally allowing the print to remain in a good, hygienic and usable condition for a long time.

Items which come under this particular category include notices, menus, workshop drawings, recipe cards, folding maps, identity passes, installation sheets, telephone and other reference lists.

Enhancement of appearance is mainly in connexion with sales appeal and is usually concerned with outer wrappings of goods, display material or prestige literature. Typical examples are folding cartons for highly-priced luxury items such as perfumes; showcards and exhibition displays; book jackets; product brochures; covers of company annual reports, etc.

Items here which may well be laminated for both appearance and protection include, for example, record sleeves, where a glossy cover contributes substantially to the eye appeal of the article in the shops and the plastic film keeps the container in a good condition whilst in use.

Materials

There is quite a wide range of heat-sealing and self-adhesive materials available, based for instance on such plastics as cellulose acetate, PVC polyester, etc., and available in varying thicknesses from about 0·001 in. upwards.

Methods

There are several types of laminator which can be classified as follows:—

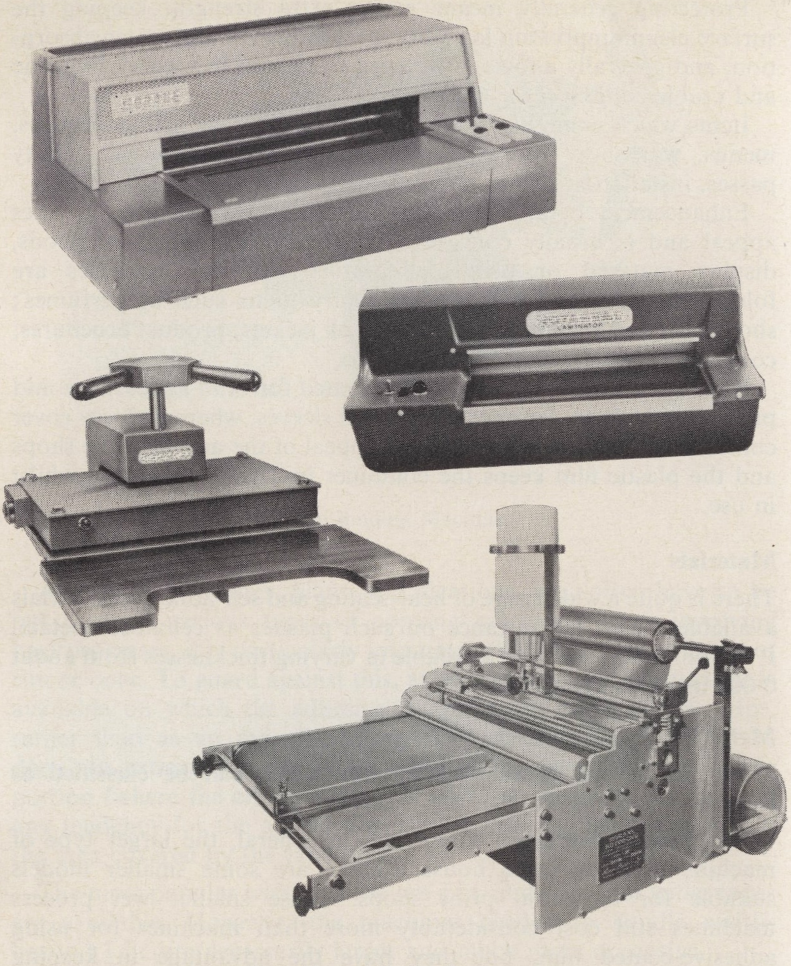
Wet process machines: These are, in general, the larger type of machine used by trade houses. There are some smaller models suitable for industrial print shops. These smaller wet process machines still cost considerably more than machines for using adhesive-coated film, but they have the advantage in keeping running costs down since they use raw, untreated film and liquid adhesive.

Heated roller machines: These employ a plastic film that has an adhesive coating on one side which is re-activated by heat.

Heated presses: These employ the same type of film, but are used for processing individual sheets instead of working on a continuous basis.

Cold roller machines: These employ a self-adhesive or pressure-sensitive film.

In all cases except where a press is used, the printed matter is hand-fed in sheet form to the machine, and the plastic film is unwound



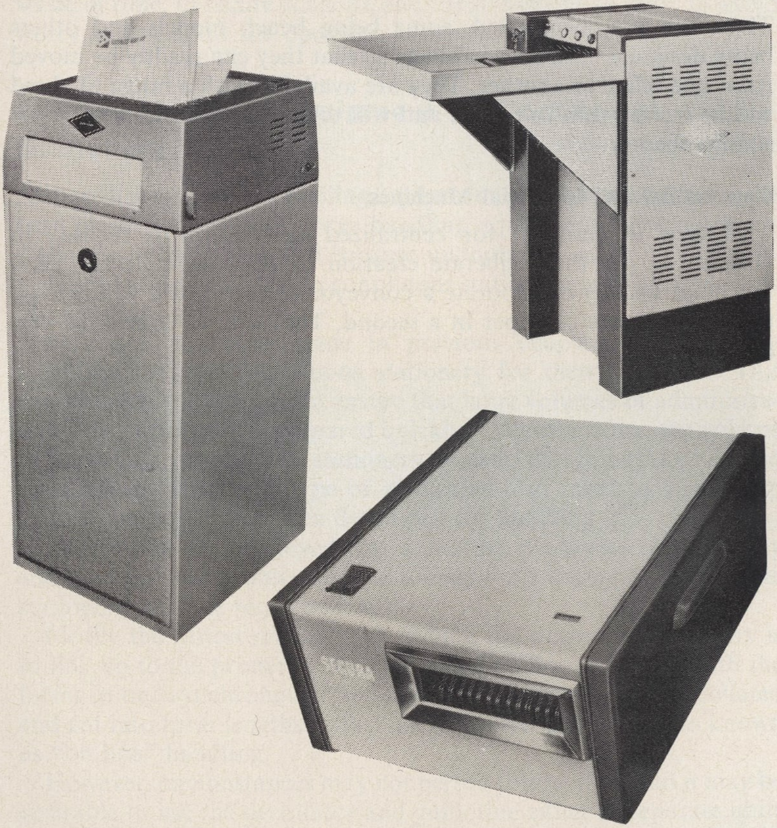
Top: Heated Roller Laminator.
Left: Heated Press Laminator. *Right:* Cold Roller Laminator.
Bottom: Wet Process Laminator.

from a reel mounted on the machine. Thus the sheets have to be separated after lamination. It is necessary to overlap or underlap sheets of print when feeding them into the laminator so that the lay edge of the print is preserved after cutting through the plastic film to separate them; they can then be knocked up satisfactorily for subsequent trimming on a guillotine. These remarks do not, of course, apply where individual sheets are being laminated, and some heated roller machines will laminate both sides of the print at the same time—*i.e.*, producing a sandwich. With heated presses the film has also to be cut to size and placed upon the print before lamination. A press is laborious for any quantity of work, but has great advantage in versatility where many one-offs of different sizes are required; it can also be used for dry mounting.

6. Shredding Machines

These machines dispose irrevocably of all types of documents from letter size to large drawings. In doing so they serve three main purposes:—

(1) Provision of security by disposal of confidential documents.
(2) Reduction of filing and storage space by planned disposal of unwanted paper;
(3) Production of first-class packing material at a fraction of the cost of wood, paper or plastic "wool".



Left: Standard Office Shredder. *Top Right:* Commercial/Industrial Shredder. *Bottom Right:* Personal Shredder.

Shredding machines operate with rotating steel wheels which burst the paper: they therefore will accept pins, clips, staples and even metal litho plates. They require little after-sales service. Most are fitted with a forward, stop and reverse action and a cut-out switch to stop the motor in the event of overloading: some incorporate an automatic reverse which ejects an overload of paper before the machine can jam.

There are three main types.

Personal Machines

These are small hand or electrically operated models designed for the personal use of executives or others who handle limited amounts of confidential material. They will take up to 3 or 4 sheets of paper at a time and the shred width is usually 3 mm.

Standard Office Machines

These are power-operated, some being bench models and others being designed on trolley cabinets so that they can readily be moved from one office to another. They are available with a range of shred widths from 1 mm to 6 mm, and will take up to 20 sheets of paper simultaneously.

Commercial and Industrial Machines

This type is designed for centralized destruction of records in volume, or for the deliberate creation of packing material. Such machines usually incorporate a conveyor belt feed, and will destroy up to 100 sheets of paper in a second. They are, of course, power-operated.

CHAPTER 25

Mail Handling Equipment

Any business undertaking, however small, has to face the problem of prompt and efficient dispatch of mail. Traditional methods of posting, if they are to be effective, require an attention to detail which occasions the expenditure of needless time and energy and, in a busy concern, posting can be a major operation requiring the employment of a considerable number of expensive staff.

Much of this operation consists of tedious routine work—addressing envelopes, folding and inserting enclosures, sealing envelopes, sticking on stamps and entering up the postage book.

The purpose of mail-handling equipment is to eliminate needless waste of time, to secure accurate and rapid dispatch of mail, to avoid worry and to allow the optimum use to be made of staff.

1. Form Handling Equipment for Continuous Stationery

Although a chapter on mailing equipment might not be ideally the best place to deal with form handling equipment for continuous stationery, it is so included because undoubtedly many of the forms produced and completed on continuous stationery, are for immediate distribution by mail.

Reference has been made in previous chapters to the many machines that use continuous stationery for their print out. This combination is necessary to ensure that large volumes of administrative paper work can be prepared quickly. In consequence, the volume of output, *i.e.*, continuous stationery, is such, that it must be handled equally fast. Since this type of stationery also requires separating, special equipment has been developed for handling it.

Decollators are employed for separating the layers of stationery and carbons and bursters or guillotines for bursting or cutting the stationery into the required lengths.

Ideally the fastest method of handling the output of stationery is to link up to the printer, a decollator and guillotine to deal with the forms in one synchronous operation. The forms are then decollated and cut into form lengths as fast as the printer prints. This is known as "on line" handling.

However, circumstances may not permit this method and it may be desirable to use the decollator and guillotine either as separate units or linked together away from the printer. This is known as "off line" handling.

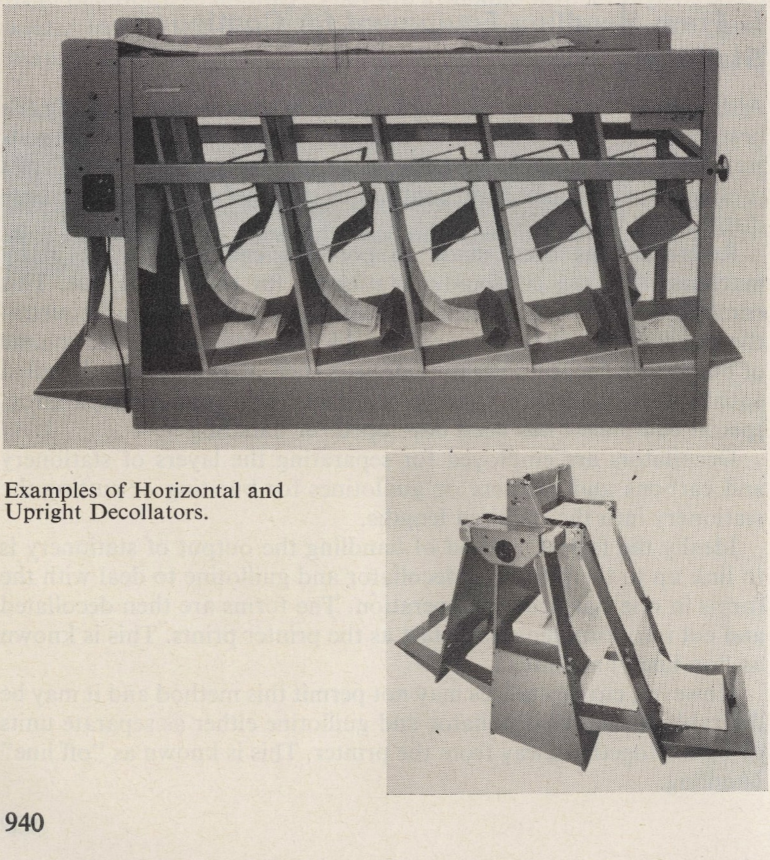
Off line handling is probably more widely employed than on line. One reason for this, so far as the use of electronic machines are concerned, is that despite the speed of the print out unit, it is still relatively slow in comparison to the processor. Therefore, when the demand for processing is greater than that of printout, priority is given to the former, with decollating and form cutting taking place as a separate operation and at a convenient time.

Other reasons for off line working are that some applications require additional information to be added to the forms after print out, or the forms may require to be passed through an addressing machine.

Imprinting units can be incorporated with some machines, so that simultaneously with the stationery being fed to the guillotine, signatures, dates etc. can be imprinted on to the forms.

Decollators

Basically these can be divided into two main types: (1) Those in which the forms are fed vertically upwards through the centre of the machine, known as "upright" or "waterfall" types, and (2) those in



Examples of Horizontal and Upright Decollators.

which the forms are fed horizontally from one end of the machine, known as "horizontal" or "conventional" machines.

In general both types extract the carbons and separate the layers of forms, allowing each layer to fall into separate trays at the base of the machine, where they refold into single part packs.

Where it is necessary to remove the sprocket punching, this is achieved by the use of rotary slitters when the forms are fed into the machine, but this is only possible on the horizontal type machines.

The number of multipart forms that a machine can handle, size of form, speed, etc., varies according to make and model. All are electrically operated and some have individual features.

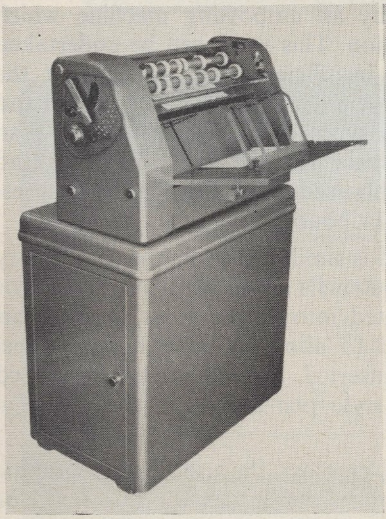
Bursters

These are so called due to the way in which they operate. This method is faster than the guillotine method, because the stationery is continually moving through the machine. Some machines incorporate rotary slitters for edge trimming and centre slitting.

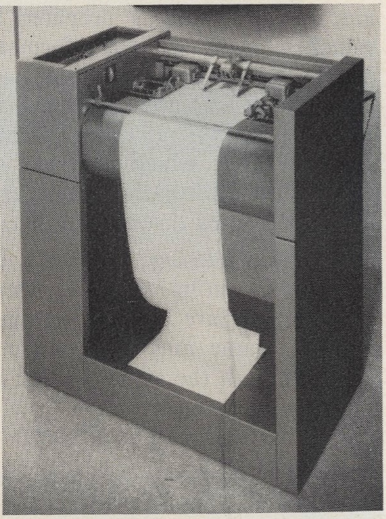
Speeds vary according to make and model, but generally several thousand feet of form can be burst in an hour. Pre-selected adjustment for depth of form is made before operation. After bursting, the forms are automatically stacked. Forms separated by this method are discernible by the rough edge along the line of original perforation.

Guillotines

These operate by progressing the paper through the machine, stopping it at the required measurement and cutting. Because of this,



A Preselector Variable Depth Form Burster.



Electronic Pre-Programmed Variable Cutting Guillotine.

they are slower in speed than bursters. However, since it is desirable in some applications to keep sets of forms together with carbons interleaved, a single set can be obtained by cutting a continuous set. Additional data can then be added at a later date.

Guillotines can either single cut, on one side of the perforation, or double cut either side, to leave forms with clean edges. This is most important where mailing and inserting machines are used.

The number of multiple sets that can be cut, depth and width of cut, speed, etc., varies according to make and model.

Combination Machines

More complex machinery, in addition to removing carbons, separating layers and cutting forms, is able to fold and insert the forms into envelopes. Thus from printout to mailing is an "on line" continuous operation.

2. Addressing Machines

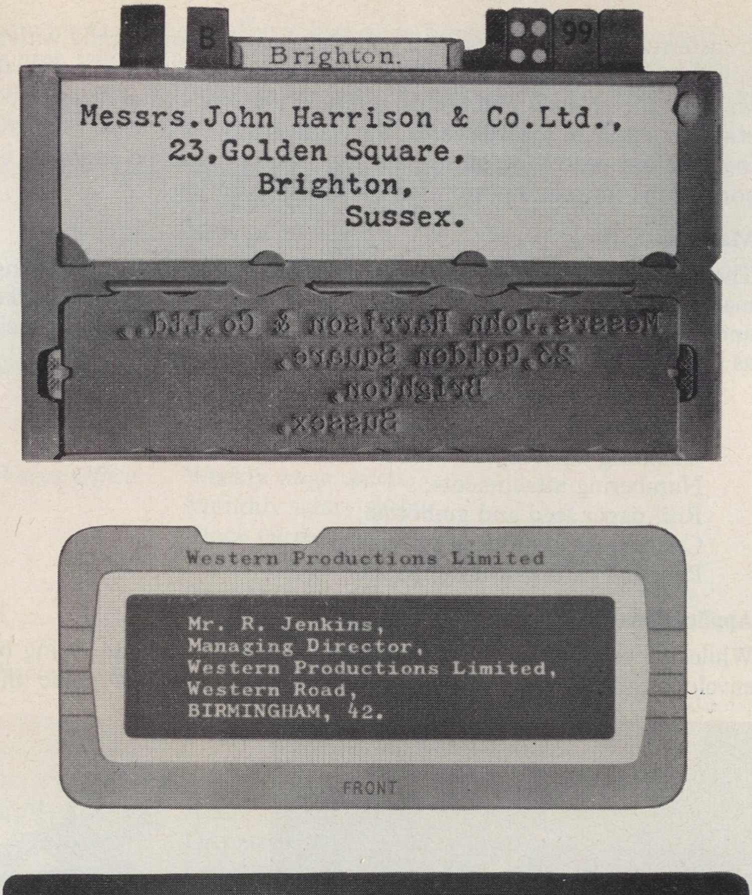
Where there is a regular and repetitive need for the bulk posting of envelopes, considerable time and effort is involved in the addressing of the envelopes. To obviate the need for individually writing or typing the addresses, machines have been developed over many years, so that this arduous and often tedious task has now been completely eliminated.

Basically there are three types in use.

Plate addressing: The plate is a metal one made from either zinc or alloy and is prepared by an embossing machine which punches out the desired information. This work can be undertaken by the manufacturer if there is insufficient work to warrant the purchase of an embossing machine. Such plates can be blanked and re-embossed several times. Some types of plate are fitted into an overall frame, which also has space for the insertion of a card bearing the information that is embossed. With this type the impression is obtained through an inked ribbon.

Stencil addressing: This method is similar in principle to ordinary stencil duplicating. However, the stencils are much stronger and for this purpose are supplied mounted into card frames. Again, this type of frame may be extended to allow an identification label (printed from the stencil) to be inserted. Stencils are usually typed but can be handwritten with a stylo pen and, with the use of a corrective fluid, can be altered.

Spirit addressing: This method employs the use of hectographic carbon masters. The address or desired information is hand or typewritten on to a sheet of plain or gummed masterpaper backed by the carbon. The impression formed on the reverse side is then


B
Brighton.
99

Messrs.John Harrison & Co.Ltd.,
23,Golden Square,
Brighton,
Sussex.

Western Productions Limited

Mr. R. Jenkins,
Managing Director,
Western Productions Limited,
Western Road,
BIRMINGHAM, 42.

FRONT

British Stationery &
Office Equipment Association,
6 Wimpole Street,
London, W.1.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
6 5 4 3 2 1
1 2 3 4 5 6 7 8 9 10 11 12 65 66 67 68 69 70

Examples of Metal Plate, Stencil and Spirit Master Used for Addressing transferred to the envelope by a pad, dampened automatically with a spirit. Masters can be placed in plastic frames and sorted in a similar way to other plates. The use of gummed masters allows them to be stuck to ledger or records cards, thus converting them to an addressing medium ready for immediate use. Masters can be supplied in continuous form and perforated for easy separation.

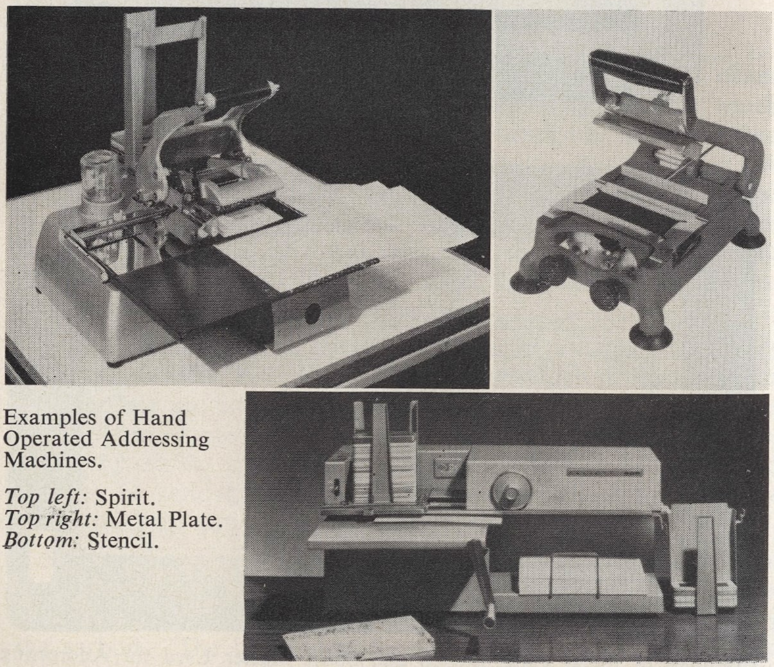
Machines

The machines into which the plates or stencils are fed for addressing may be operated by hand or power. In addition, according to make and model, many additional features may be incorporated, such as:—

Automatic feed and selection devices;
Automatic stops;
Counting devices;
Numbering attachments;
Roll paper feed and guillotine;
Continuous stationery attachments;
Punched card link-up units, etc.

Applications

While the original use of these machines was for the addressing of envelopes, improvements and developments have now made the



Examples of Hand Operated Addressing Machines.

Top left: Spirit.
Top right: Metal Plate.
Bottom: Stencil.

equipment adaptable for a very wide range of office procedures. It is not within the scope of this handbook to detail the various applications, but for the purposes of interest and knowledge a few of the uses are mentioned as follows:—

Accounts Office	Addressing statements
	Heading ledger cards
	Lists of customers
	Traders' credit slips
	Bank lists
	Addressing envelopes
Secretarial Office	Preparing dividend lists and warrants
	Preparing annual returns
	Circularizing shareholders
Wages Office	Weekly wage sheets
	Monthly salary sheets
	Clock cards
	Pay envelopes
	Personnel records
	Addressing envelopes
Invoicing Office	Invoice addressing
	Invoicing: special units covering specific products, prices extensions, discounts, etc., may be incorporated to facilitate invoicing.
Mail order work	Addressing labels
	Dispatch lists
	Ledgers and payment cards
	Reminder letters
	Circulars
	Addressing envelopes
Factory work	Order, route and batch cards
	Material requisitions
	Job cards
	Inspection forms
	Stores requisitions
Sales Office	Direct mail envelopes
	Sales prospect lists
	Price list and catalogue envelopes
	House journal wrappers

The list is almost inexhaustible, but the above will show the considerable versatility of such machines.

Examples of Automatic Electric Addressing Machines Suitable for a Wide Range of Office Procedures.

Top left: Stencil.
Top right: Spirit.
Bottom: Metal Plate.

3. Collators

The collating of sheets or documents simply means the gathering of them together in the right order. This work can of course, be carried out by hand, but the more usual method today is by machine, which is quicker and less costly. The need for collating can be found in print-rooms, binderies and the mail room, and the last-named need is the reason for the mention of collators in this chapter.

Where a considerable number of different enclosures have to be inserted into envelopes, collators are usually incorporated with a folding and inserting machine. These can, however, be bought and used as separate units as use demands. Further reference is made elsewhere and in the chapter on Reproduction Process Ancillary Equipment.

4. Folding Machines

It is no longer necessary to perform the tedious job of folding thousands of enclosures by hand. With the folding machines now available, industrial and commercial firms can deal swiftly and easily with statements, invoices, price lists and circulars. These machines offer the user the following benefits:—

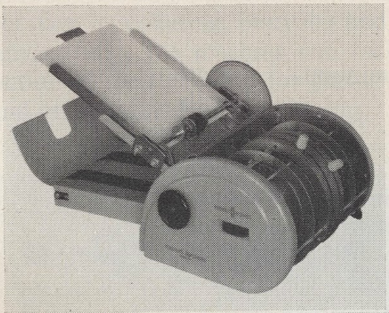
(1) They are approximately 25 times faster than working by hand and, of course, staff numbers are accordingly reduced.

(2) The insertions are folded exactly to the correct size and in the correct manner, a vital consideration when dealing with window envelopes.

(3) Folding machines will also slit, score and perforate paper.

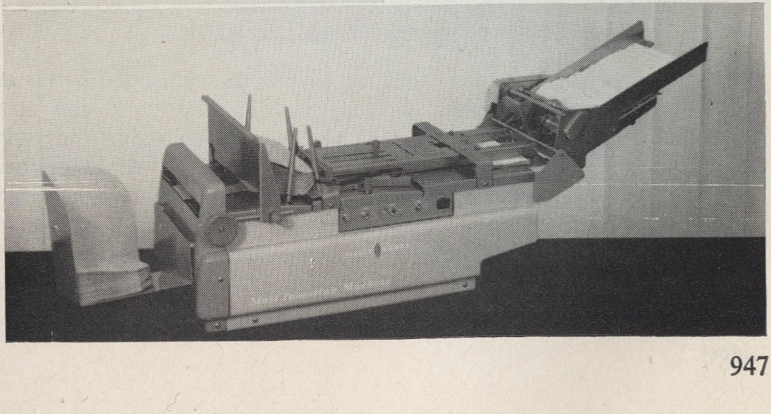
The machines generally are compact desk-top models, hand or power operated. Most are designed to feed paper material automatically to the folding mechanism and to stack it when folded. Minimum paper size is usually about 3 in. × 3 in., and the maximum foolscap or brief size, but equipment is available to handle larger sizes. Speeds range from approximately 5,000 sheets to 20,000 sheets per hour according to paper size and fold.

The majority of machines can make two successive folds in one operation. Some are able to perform up to about four different folds, while others can accommodate eight or more. Folding positions are determined by the adjustment of knobs or dials. Attachments for cross-folding, perforating, slitting and scoring, are standard features on some models, or may be supplied as optional extras for others. Unit counters are likewise available.



Desk Model Folding Machine with Automatic Feed.

Inserting Machine.



5. Inserting Machines

Any organization that sends out a large volume of mail regularly will be familiar with the tiresome task of ensuring that all the requisite pieces of paper find their way into the envelopes. Often the job has to be done at speed within a given time. Accounts departments of manufacturers and wholesale and retail suppliers, for example, have to send out statements and invoices at the end of every month.

Where computer accounting systems are installed, their vast output may render inserting machinery absolutely necessary.

Such machines are used for inserting prefolded documents, tabulating cards, premium notices, business reply envelopes and other material of envelope size. Speeds vary from 4,000 to 10,000 per hour.

6. Folding and Inserting Machines

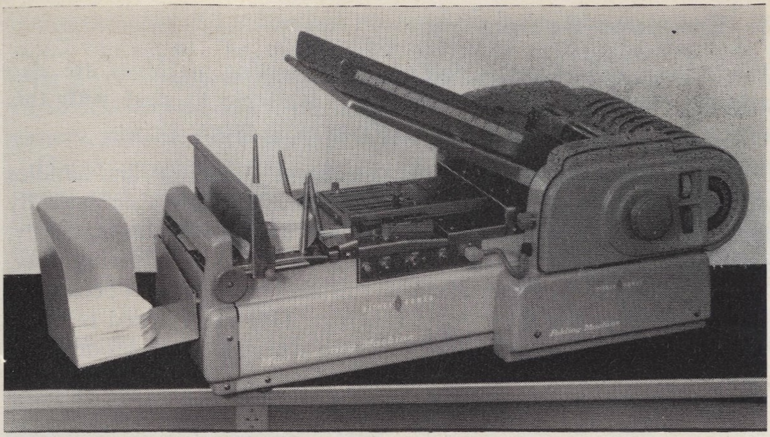
There are folding machines available which can easily be coupled to an inserting machine supplied by the same manufacturer. They will fold and insert a wide range of paper stock, including sheets stapled together. Two enclosures can be accommodated simply by putting the material through the machine twice. Or several pieces can be handled in one operation by nesting them together in advance. Speeds of up to 4,000 sheets per hour are dependent on the type of work and size of material and model of machine. Factors that have to be taken into account are:—

Enclosures	Maximum/Minimum	Length
	”	Depth
	”	Thickness
	”	Paper weight
Envelopes	Maximum/Minimum	Length
	”	Depth
	”	Quality of envelope.

7. Collating, Inserting and Sealing Units

Machines for collating and inserting have been mentioned so far as individual units. More sophisticated machines, however, can now combine a number of operations. Models are available that will handle a wide variety of sizes and types of material, ranging from single items and folded material to publicity matter, booklets and catalogues. These machines can handle up to 8 separate inserts in one operation at speeds of 7/10,000 completed envelopes per hour.

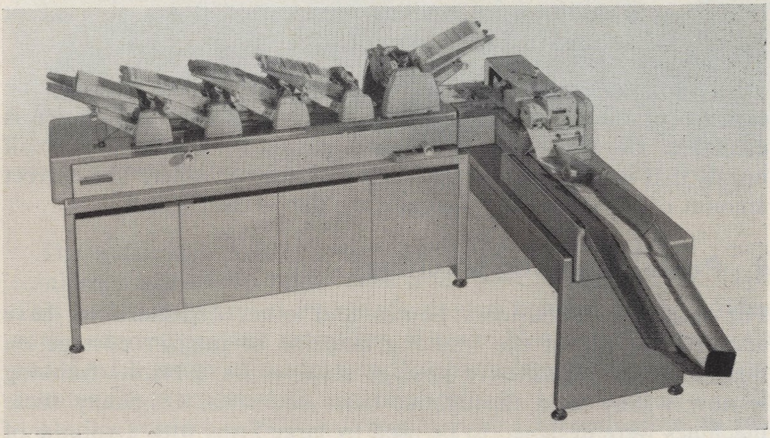
Different enclosures are loaded into hoppers and the envelopes are similarly loaded into their feed station. The machine collates folded



Folding and Inserting Machine.

or unfolded documents; nests a number of documents; opens envelope flaps; inserts contents; and seals, counts and stacks the completed envelopes in a continuous operation. Such machines range from an office size 2-station machine to an 8-station model designed for the larger business and the mailing houses.

Recent developments now allow a franking unit to be built on the collating/inserting machine to frank the material in the same operation as collating, inserting and sealing. With this additional franking unit, the machine can tackle a complete operation in a fraction of the time used for performing any one of these tasks by hand or by individual machines.

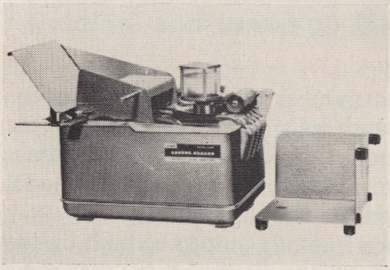


Collating, Inserting and Sealing Machine with Franking Unit.

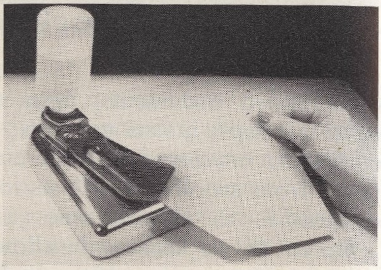
8. Envelope Sealers

While the more advanced folding and inserting machines are also able to seal envelopes, machines are available to deal with this operation separately, and there are two main types.

(*a*) The first may be manually or electrically operated, and handles only one size of envelope at a time. The envelopes are automatically fed, the gum is moistened and the flaps are sealed automatically, and the completed envelopes are stacked into a receiving tray. Various devices are employed within the machine for these operations, but all perform the same basic function. Operating speed is up to 18,000 envelopes an hour, depending on size, and some models will accept envelopes up to 15 in. wide.



Electrically Operated Sealer for all Sizes of Envelopes.



Hand Sealer.

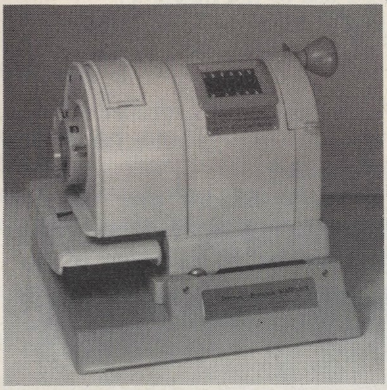
(*b*) Another type of machine is used where there is an assortment of sizes of envelopes to handle. Here the envelopes are fed in by hand, and spring-loaded carrier rollers automatically adjust for thickness. In addition to handling mixed sizes, it can also accept various thicknesses to a maximum of $\frac{3}{4}$ in.

(*c*) For very small quantities of envelopes that do not justify the expense of the more elaborate machines, a small hand sealer is available. The flap of the envelope is passed by hand over a small nozzle that is fed by an inverted glass water container. The correct amount of moisture is applied and the flap is then sealed.

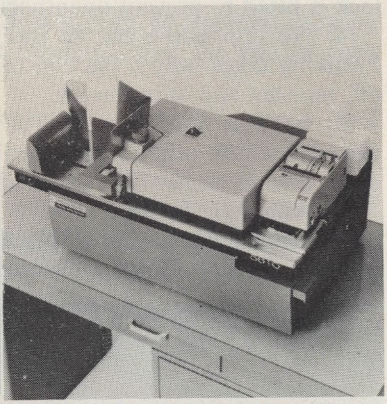
9. Postal Franking Machines

For many years business houses and other organizations have adopted the use of the franking machine to imprint postage on mail in place of adhesive postage stamps. As a result, franking is now widely used throughout most countries. Originally these machines were designed to be used by large firms with a volume of mail running into thousands of pieces a day. In more recent years the advantages of the franked mail system have been recognized by small businesses. To meet widely differing needs, manufacturers offer a very comprehensive selection of machines. They range from small desk-top models to the large electric, heavy duty, floor standing variety, suitable for every type and volume of mail.

Hand operated models can frank up to about 3,000 pieces per hour, and electric versions between 5,000 and 10,000 per hour. Generally the machines can accommodate any size, although a few have limitations. While some machines can accept a package thickness of up to $\frac{1}{4}$ in. or $\frac{1}{2}$ in., others are variable. In their development several refinements have been introduced. Most models incorporate a label device. This dispenses a metered stamp on to a gummed label and is useful when envelopes or packages are too thick to pass through the machine. Some machines can be provided with attachments for automatic feeding, sealing and counting. The more advanced models are able to feed, seal, frank, count and stack in one continuous operation. With these, the meter is usually a light-weight detachable one, easily removable from the machine base, and provided with a carrying case for taking to the post office for resetting. Safety devices prevent use of the machine until envelopes or labels are fed into it.



Hand Operated Franking Machine.



Electrically Operated Franking Machine with Sealing, Counting and Stacking Facilities.

The maximum postal denomination that each model of postal franking machine can print varies from 1s. to as high as 99s. 11$\frac{1}{2}$d. This variation is caused by specific models being produced to deal with certain types and quantities of mail. The manufacturers have produced a range of models, so that there is a particular machine suitable for every business, regardless of size.

Decimalization in 1971, will require postal denominations in new pence only. This means that machines will have to be replaced or converted. The latter is effected by changing the die to one giving the value in pence, but without monetary symbols.

The franking machine imprints the desired postage and a cancellation mark which shows the county and town, or city and postal district number, in which the user is situated. It will also print a small slogan advertisement on the mail beside the postmarks in the same operation as the imprinting of postage. Such advertisements should be approved by the G.P.O.

Advantages of the Postal Franking Machine

(1) The use of a postal franking machine obviates the need for frequent trips to the post office in order to maintain a stock of adhesive stamps and the calculation of how many of each denomination to buy.

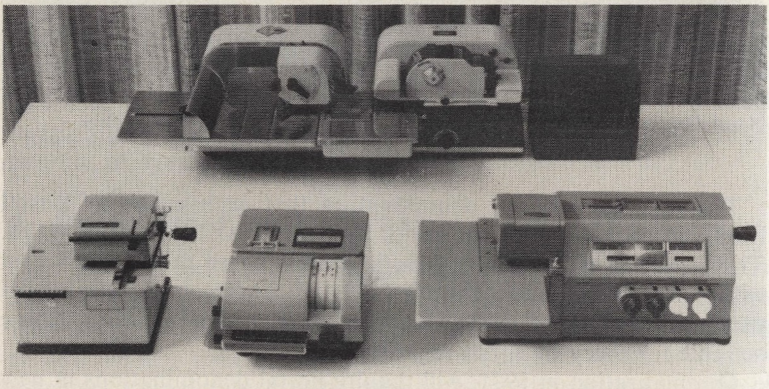
(2) "Borrowing" and loss of stamps are prevented. Franked impressions do not exist until produced by the machine and then they are non-negotiable.

(3) Prepayment of postage is made by cheque and entered on duplicate record cards. Meters show at a glance the total amount franked and the balance remaining in credit. Accounting is simplified, and it is unnecessary to maintain a post book for this purpose. A lock is fitted to prevent unauthorized use of the machine.

(4) No impression can be franked until an envelope is inserted. Franking takes only a fraction of the time required to choose, tear off, moisten and affix stamps.

(5) Because franked mail is already faced and cancelled when it reaches the post office, it is passed through the post office faster, and often catches earlier mail trains and planes.

(6) Although franked mail is normally handed over the post office counter, the use of a special late-posting envelope will ensure speedy handling of mail after office hours.



Manually and Electrically Operated Franking Machines for Small and Large Users.

(7) Each postage meter stamp has a number which is registered at the post office in the user's name. This number can be used to trace lost parcels when mailing labels become torn off.

Post Office Regulations for Postal Franking Machines

(1) A licence must be obtained from the local head post office. (The postal franking machine suppliers will obtain the licence for the user.)

(2) Payments in advance in respect of postage can be made from time to time at the discretion of the mailer, at a specified post office where the meter must be presented for setting. The setting can be done quarterly or at any desired time interval. Payments are in multiples of £5, from £5 to the limit of the particular model in use.

(3) The mail franked by the machine must be faced (so that the addressed sides all face upwards), tied in bundles (certain separations are required) and handed in at a specified post office. Postings can ordinarily be made only at the specified post office, but under certain conditions it is permissible to post fully-paid mail in post boxes after the normal posting office is closed. Inquiries regarding these conditions should be addressed to the local head postmaster.

(4) At the end of every week, a docket must be tendered showing the readings of the meters of the machine as at the end of each weekday.

(5) Licensees are required to have the machine inspected and maintained by the manufacturers, or by their agent, not less frequently than twice in each period of six months, so that such repairs as may be necessary may be effected to ensure clear and distinct meter impressions and complete accuracy in recording.

(6) Machines must be hired or purchased from the supplying companies licensed by the Postmaster-General.

Stamp Fixing Machines

One or two small machines are available that dispense actual stamps that can be bought in roll form from the post office. Security devices are incorporated, and, according to make and model, several values of stamp can be used.

They are hand-operated, and, by placing the machine in position on the envelopes and pushing down the handle, a stamp is released, moistened and affixed to the envelope.

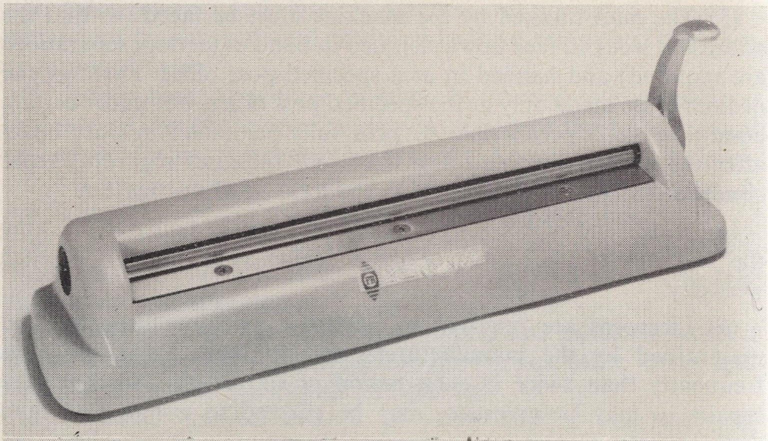
10. Letter Balances

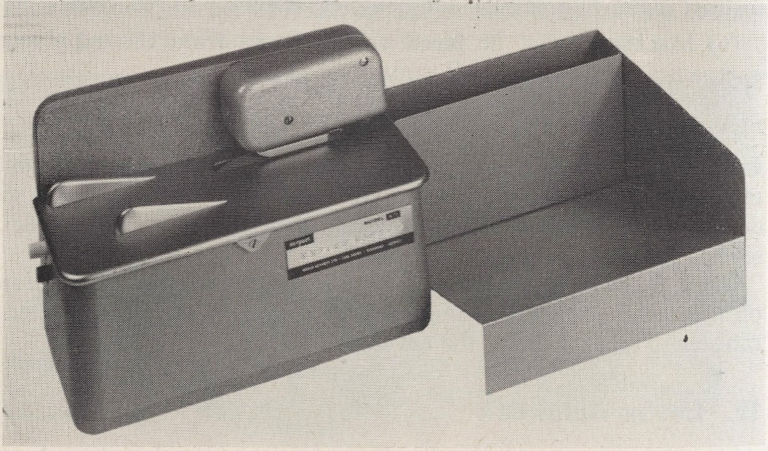
Although an essential item of mail room equipment, these have been dealt with, together with parcel balances, under Stationers' Sundries.

11. Letter Openers

Just as important as the efficient dispatch of mail is the speedy opening of incoming mail. The paper-knife is useful where just a few envelopes are concerned, but for quantities machines are available that can open envelopes far more quickly than can be done by hand. They may be divided into two main types:—

Guillotine: Here the principle is one fixed blade and one movable blade which is depressed by a lever. The envelopes are fed singly, and depression of the lever removes a thin strip—approximately $\frac{1}{16}$ in. —thus opening the envelope.





Hand Operated Guillotine Type Letter Opener.

Electrically Operated Rotary Type Letter Opener.

Rotary: These may be operated by hand or electrically. With the former type, envelopes can be opened at the rate of 80–100 per minute and with the latter at approximately 500 per minute. Both types operate in a similar manner. Envelopes are automatically fed into the machine along a guide channel to a pair of rotating knives which cut a thin sliver off the envelope. The amount to be trimmed can be adjusted according to the type of envelope—*e.g.*, a cloth-lined envelope will need a deeper cut than an air mail one. Such machines are usually fitted with a tray to receive the opened letters and shavings.

12. Mail Distribution

This will vary according to the type and amount of mail. It is a question of method rather than machine, although certain ancillary items may be used. Time and date stamps to record actual receipt, or numbering machines to number items of mail consecutively are often used. Details of these items will be found in the chapter on Stationers' Sundries. Letter sorters for departmental use and mail trolleys may also be employed. Whatever method is adopted, and irrespective of the equipment employed, the basic requirements are:—

(1) To open the mail as speedily as possible;
(2) To record (if necessary) and sort it as quickly as possible;
(3) To distribute it as early as possible after receipt.

Conclusion

Efficient mail-handling is vital in every branch of commerce. Lack of modern equipment in the mail room can create a bottleneck which will impair the overall efficient functioning of the whole organization.

Manifestly the biggest savings are made by the biggest organizations—government departments, direct mail houses, insurance companies, building societies and large manufacturers or service industries; but no organization is too small to profit from some or all of the machinery designed to handle mail swiftly and efficiently.

CHAPTER 26

Telecommunications

Communication, so far as this chapter is concerned, involves speech, sound and sight, and the methods available combine to form what are collectively called telecommunications. Such is the advance of technology that they are now part of the everyday life of every person and without them no office, factory or organization could function or exist. Today it is possible to communicate directly not only with people and businesses in the same street, town, city and country, but also on the other side of the world.

A good communication system should provide a quick, simple, reliable and economic means of communicating between two or more people externally and/or internally. However, research and investigation are constantly revealing insufficient planning, working inefficiencies and the like, resulting in bad and expensive communication. Ideally, efficient communication should be considered at the drawing-board stage of any building project and/or during the initial planning of external or internal requirements concerning communication, organization systems, procedures, etc. Wherever possible the system should be tailor-made for the particular application.

The aim of this chapter, therefore, will be to present to the reader, so far as possible in non-technical language, the various systems available and some of the more recent advances in techniques employed. In any customer-orientated organization the principal method of communication is the telephone that connects to the outside world, and this is where the subject will commence.

1. Brief History

Although information could be transmitted by electricity in the early part of the 19th century, we really owe the marvel of modern communication to a Scot, Alexander Graham Bell, who was born in Edinburgh in 1847, but who spent most of his life in America. He discovered the secret of electrical transmission of speech in 1875, and a year later made the first telephone. In Great Britain there was an immediate interest in Bell's invention, and it was not long before telephone systems were established by the Post Office and by several private companies. It was decided by the Government that a single unified system would be best, and in 1912 the Post Office acquired almost the whole of the country's telephone network.

At that time there were about 700,000 telephones in this country; today they number well over 10,000,000. In less than 100 years since speech was first transmitted by electricity the General Post

Office and private industry have developed telecommunications to a point where one can speak to virtually anyone, anywhere in the world, at will.

About the same time as the telephone was invented, experiments were being carried out with "wireless" communication, and by 1897 the Marconi Wireless Telegraph Co. was formed. This side of communications also developed rapidly over the years until today telecommunications are achieved by the aid of both wire and wireless methods. Whenever a telephone call is made, a telegram sent, or a radio or television programme received, the chances are that both methods of communicating are being used.

2. G.P.O. Public Services

The General Post Office provides the public telecommunications in Great Britain, of which the telephone and telegraph services are the best known.

Telegrams may be sent to most parts of the world, to ships—whether at sea or in port—to aircraft in airports or even to trains in stations abroad. Such telegrams may be sent from any telephone or from any post office where telegram business is handled.

The telephone system provides telephone boxes for use of the general public and private telephones in homes and offices. Calls can be made to or received from any of the 200 million telephones throughout the world. Much of the system is automatic, and many calls, including those to many foreign towns and cities, can be dialled direct.

To provide for the telephone requirements in homes, offices and works the G.P.O. supplies single telephones to the public exchanges, extension telephones on those lines, or private branch exchanges consisting of one or more exchange lines and with facilities to connect them to a number of extension telephones. These **Private Manual Branch Exchanges** (PMBX) have to be operated by telephonists employed by the renter and they can be of any size, sometimes even larger than the public exchange. Such PMBX's are provided and maintained by the G.P.O. on rental terms as required.

3. Private Automatic Branch Exchanges (PABX)

At a PMBX, both external and internal calls are handled by an operator. To provide a rapid internal service and maintain an efficient external service, a wide range of *Private Automatic Branch Exchanges* have been designed. These comprise a manual switchboard for external services and an automatic switchboard for internal calls. Although external calls can be obtained via the operator, they can

Private Automatic Branch Exchange (PABX Cordless).

also be made direct to the public exchange, by dialling a special access number. Like the PMBX system, PABX can be of any size. Properly planned it can offer the most efficient service. In certain circumstances, especially where key operated PABX's are employed, the number of operators can sometimes be reduced.

The smaller sizes—with less than 50 extension telephones—are provided and maintained by the G.P.O., but the larger types have to be specially designed to meet individual needs and, although meeting G.P.O. specifications, are provided by private firms. They are invariably bought by the customer, installed by the contractor and subsequently maintained by the G.P.O.

Although the PABX's are automatic, an operator is always required to deal with incoming calls. However, in many cases she is provided with a simple keyboard instead of the larger manual switchboard and works like a clerk at a desk rather than as a telephone operator. All calls within the system—*i.e.*, from office to office—and calls outgoing to the public network are dialled direct from the originator's telephone and connected by the automatic equipment. PABX equipment can be modified to bar trunk calls from certain telephones, while they are allowed to make other types of calls, and special facilities can be incorporated to almost any requirement.

4. Internal Communication Systems

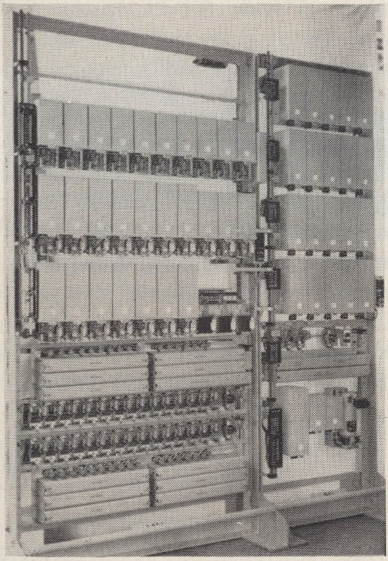
The advantages of an internal telephone system are two-fold. Firstly it allows external telephones to be reserved for their prime function—the receiving of incoming calls—thereby ensuring that the caller is connected with the least possible delay. Secondly it ensures fast communication with all departments on the system, thereby enabling all staff to perform at maximum efficiency.

There are many different types available, and additional facilities can be incorporated dependent upon the particular installation and the needs of the user. Such systems, however, can be broadly classified and explained under two main groups.

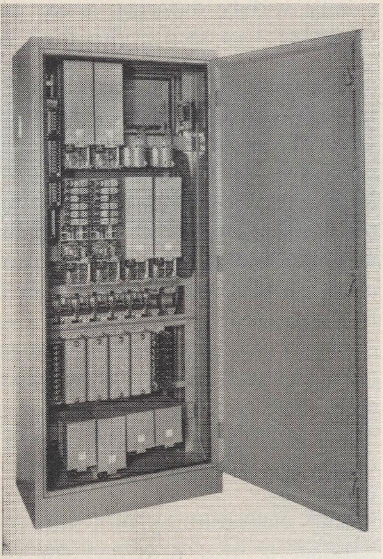
Twin-wire Cable Systems (PAX)

These systems usually employ **Private Automatic Exchange** equipment. As the name suggests, this is a completely automatic private telephone system obviating the need for an operator. It is entirely separate from the G.P.O. system, which means that the G.P.O. telephone and switchboard are left free to deal with external calls. The system is fully secret throughout all extensions, and can be provided in sizes from 10 lines up to 600 lines in cabinet form and up to 10,000 or more lines with open rack equipment. This latter is used when it is desired to extend the system to an unlimited number of lines.

The apparatus consists of an exchange unit of suitable size, dependent on the size of installation, and power equipment. The power, wherever possible, is direct from the a.c. mains, using a battery eliminator, or, when considered necessary, a lead-acid battery and automatic battery charger. Instruments are of the conventional dial type, numbered 0–9, and are connected to the



Open Rack Type PAX Switchboard Equipment.



Cabinet Type PAX Switchboard Equipment.

exchange unit by twin-wire conductor cables. In certain circumstances this is incorporated in multi-core cable for ease of installation.

The system is designed to operate with telephone sets similar to the G.P.O. type and in keeping with current British standard. For numbering the extensions, single, two, three or four digit numbers are used, dependent upon the size of installation. Operation is by dialling the allocated number which connects to the required telephone. Tones are incorporated to signal engaged, ringing out, and dialling (*i.e.*, free to dial).

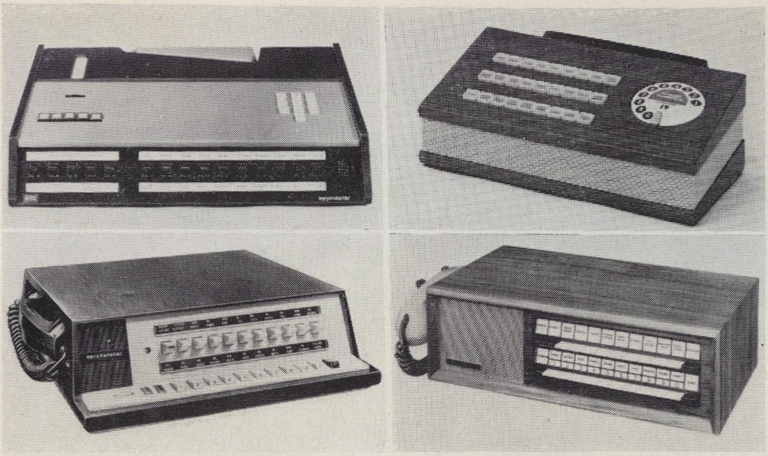
PAX Desk Handset.

A wide range of facilities is available, which make it possible to satisfy widely differing needs and to provide for expansion and variation:—

Master Unit: This is combined *direct access key calling* and *loudspeaking* facility, usually for executive use. Direct access keys to selected extensions afford the user direct and instantaneous connexion to the desired extension without the need to dial. Calls made in this way give a distinctive ring, so that the called person knows that an executive is ringing. If the extension is engaged, the master unit can intercept the conversation by the pressing of a *priority* key, or it can arrange to call the extension automatically as soon as it becomes clear.

Direct access key caller systems require multi-core cabling back to the exchange unit (although this can be overcome by using an electronic master, which pulses out the numbers automatically). The number of extensions used in this way is limited to 20. However, other less important extensions can, of course, be dialled in the usual way.

The loudspeaking unit allows *hands free* communication, but a handset is also provided for private conversation. Alternatively, the loudspeaking facility can be omitted.



Typical PAX Automatic Master Units.

Executive Right of Way: This has already been mentioned as a priority service. It allows the executive to interrupt an engaged extension simply by pressing a button. In the case of a master telephone, a special intrusion tone indicates that the call has been intercepted.

Conference Lines: A number of extensions can be switched to a common line, so enabling executives to converse simultaneously without leaving their desks.

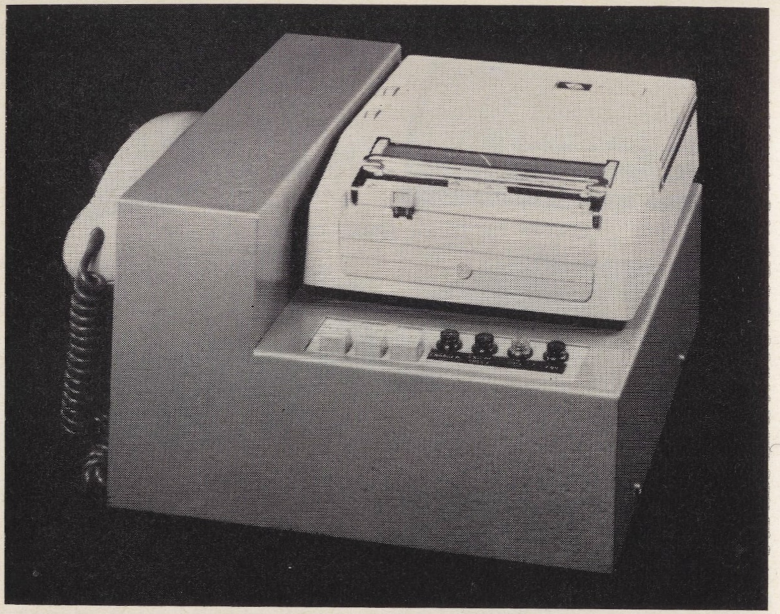
Staff Location: Staff absent from their offices can be located by visible or audible signals in selected locations. A special locating number is dialled, followed by the numbers of the personal code of the executive. In certain circumstances a loudspeaker can be connected to the system for this purpose.

Secretarial Service: A secretary can be provided with a special telephone to allow her to "filter" incoming calls to the executive.

Dictation and Recording: The system can be used for centralized dictation. There are several ways of doing this, but usually a certain number is allocated. When this is dialled, the telephone is switched to the recording machine. By dialling other pre-arranged codes, the recording can be played back, or corrections can be made.

Tie Lines: Where the same organization is situated in several buildings at distances apart, each with its own PAX system, these can be linked via a G.P.O. line to allow a fully integrated system.

Fire Alarm Service: The PAX exchange can be arranged to give a fire alarm service that will meet the requirement of any organization provided it is not a high fire risk situation. By dialling a fire



PAX Dictating and Recording Unit.

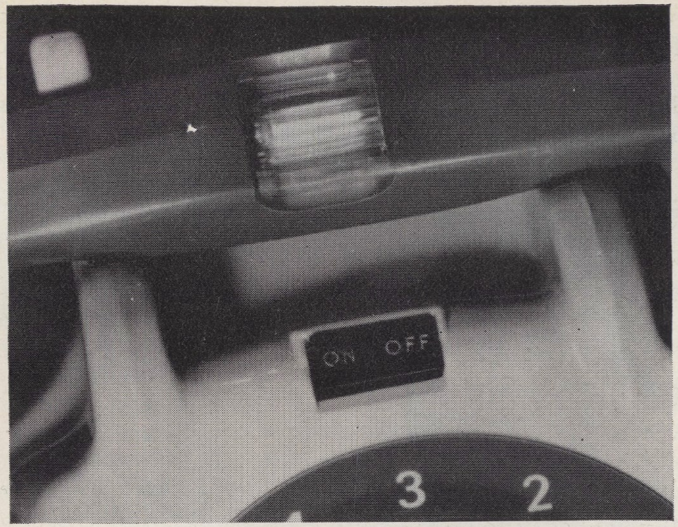
number, such as 99, from any telephone, alarm bells are operated. A refinement of this is zone indicator panels.

Watchman's Service: Telephones can be used for recording times at which a watchman passes a telephone point. The watchman dials a pre-arranged number and a permanent recording is made on a time-recording drum. An automatic warning is incorporated to register if he does not reach the next point on time.

Amplified Handset: This incorporates an amplifier and volume control, and is useful for people with hearing deficiencies.

Visual Call Handset: For visual identification of the called telephone a neon lamp can be fitted to the handset which operates in unison with the incoming ring. If necessary the bell can be silenced by depression of a button while the light continues to signal. This set is useful where there are several telephones situated together or in open-plan offices, or noisy locations.

Desk Telephone with Loudspeaker: This proves for hands free communication. A button is depressed for loudspeaking. When private conversation is required, the handset is lifted and the instrument reverts to normal use. The built-in microphone is fitted with an adjustable volume control and the loudspeaking unit is separate so that it can be placed in most suitable position.



Visual Calling Lamp on PAX Handset.

PAX Loudspeaking Unit.

Multi-Core Cable Systems

These systems are used for smaller type installations and are widely known as *intercom* telephones. This is misleading, as equipment previously described is also used for similar purposes. The principal difference is that no exchange unit is required, since multi-core cable is used so that each telephone can call direct to every other telephone on the system. For reasons of bulk and necessary cabling, such systems are not extendible beyond the sizes offered by manufacturers.

Press button or key operated equipment is used, with or without master stations. A typical unit takes the form of a small compact instrument containing a number of press buttons or keys and a handset. Each instrument is connected to another purely by pressing a button or operating a key. Power is by battery or mains.

Typical Intercom Telephones.

The system is wired in multi-core cable and is available in various sizes—*i.e.*, 5-way, 10-way, 20-way, etc. The maximum number of telephones that can be used to provide full communication throughout the system is one more than the number of "ways"—*i.e.*, in a 10-way system, each telephone, by means of its buttons or keys, can communicate with up to 10 other instruments, making 11 in all.

Normally the maximum number of instruments recommended on systems of this type is 21. If, therefore, the initial or estimated requirement exceeds this figure, consideration should be given to the twin-wire system. Another governing factor is the cable length, which should not exceed 440 yards, because of the danger of cross talk.

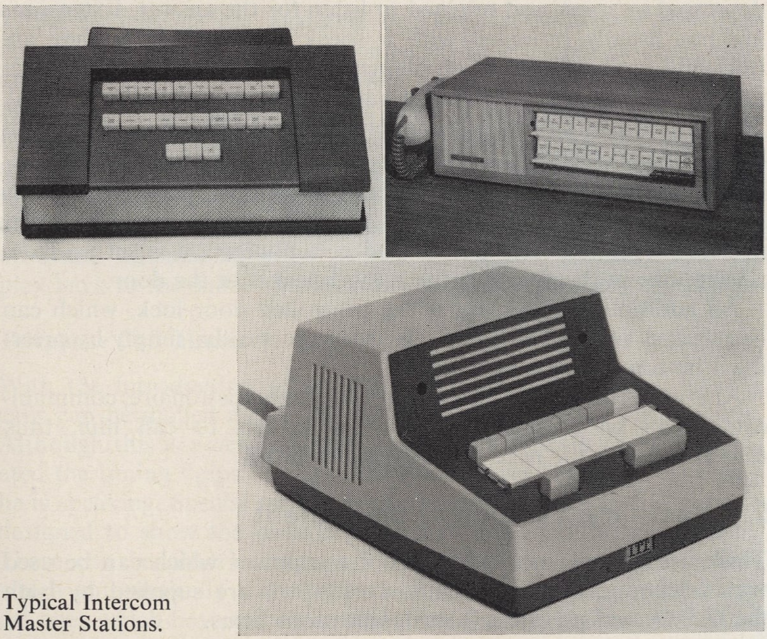
The system can be arranged for either full or partial communication. With the former, there is full intercommunication between all telephones. The latter provides for certain instruments to have full communication whilst others are able to communicate only with the central instrument. The arrangement can vary according to requirement.

Generally these systems are non-secret, so it should be realized that another person could intercept a conversation on the same system. A master station, however, is always allocated a secret speech channel.

There are several additional features that can be incorporated with the basic systems:—

Loudspeaking Telephone: This is usually provided for the executive, and up to three of these can be provided on a system. The call is made from a master station by operating the key or button. The voice of the person answering the call is picked up by a microphone and the reply is heard from a loudspeaker. Thus the hands are free and conversation can be made within a small radius of the desk. Lamp indication on the master and sub-station is provided to show who is calling. A handset is also included on the master station to allow secret conversation when a third party is in the same room.

Round Call: By this means the system can be used for staff location. A "round call" button is reserved for this facility. A code of short or long buzzes is allocated to each person liable to be called. The button is depressed in accordance with the predetermined signal.



Typical Intercom
Master Stations.

The person called answers on the nearest extension and replies by depressing the round call button on that extension.

Parallel Working: If the system has been equipped with the maximum number of instruments and a further extension is still required, but it is not economical to replace the installation, two instruments may be connected in parallel. Such an arrangement would allow two persons working in the same office to have instruments, both connexions being operated on the same line.

Wait, Engaged, Enter: Keys on the executive master can be allocated to operate a luminous indicator outside the office door, thereby signalling his instruction.

Long Line Circuit: It has already been stated that the maximum cabling on an intercom system is 440 yards. It might be necessary, however, to connect an office at more than this distance, or in subsidiary premises. This can be effected by linking with special long line equipment.

Speak/Listen: This facility generally consists of a loudspeaking master station with a number of loudspeaking sub-stations. The sub-stations cannot intercommunicate and are therefore responsible to the master station only. It enables an executive to have immediate personal communication with selected members of this staff, while remaining seated at this desk. A key is operated on the master to voice-call the sub-station. The speak switch is then depressed to speak and released to listen for the answer. Extensions are not usually provided with a speak/listen switch as they are normally used as open microphones. Incoming calls to the master unit are indicated by an annunciation button and audible signal. The system has limited application, but is suitable for such needs as production control.

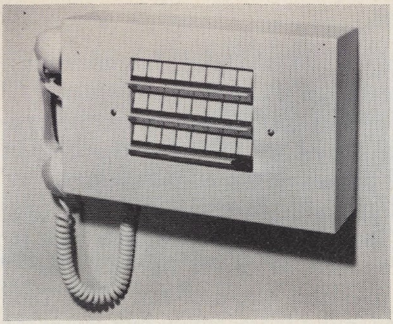
Entryphone: This system operates from a street door to any number of apartments. It is ideal for multi-storey flats. The caller presses the appropriate button and communication is set up from a telephone in the apartment to a loudspeaker at the door.

An additional refinement is the controlled door lock, which can be released and locked again, electro-magnetically, simply by pressing a button on the telephone.

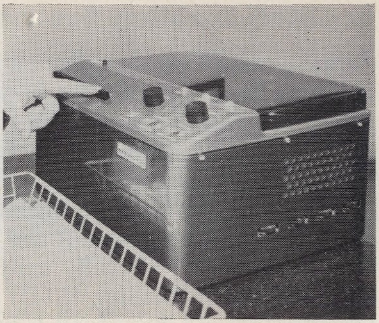
Alternatively, where there is a porter or commissionaire, communication can be arranged to allow occupants to call him, thus dispensing with the need for door lock control.

5. Ancillary Telephone Equipment

There are several ancillary items of equipment which can be used with telephone instruments, most of which are supplied by both the G.P.O. and private telecommunications firms.



Entryphone Unit.



Telephone Answering Unit.

Telphone Amplifiers

There are several types of equipment which amplify the incoming speech on the telephone. Some are small amplifiers incorporated in the handset, while others provide a loudspeaker and separate microphone enabling the telephone to be used without holding the handset. These types of equipment are very useful for the hard of hearing or for people who wish to have their hands free while telephoning.

Telephone Answering Equipments

These equipments are available on rental only from Post Office approved suppliers. They are connected to a telephone instrument and, in the simplest form, answer the telephone by means of a pre-recorded message. The most popular and widely used instruments, after answering the caller, will then record the incoming message, continuing to record until the caller either rings off or remains silent for 15 seconds. At this point a recording thanks the caller, and confirms that the recording has been made. The most advanced instruments when given a confidential spoken code, will play back to the caller all previously recorded messages.

Telephone Call Timers

With the introduction of subscriber trunk dialling, long distance calls can be dialled direct without the intervention of an operator. Although this is a very efficient way of making calls, it has eliminated the timing "pips" and the caller no longer knows for how long he is speaking. Special meters can be rented or purchased which are designed to show the passage of time when a call is being made. These can be electrical devices, connected to the telephone line, which automatically record the amount of time used, or mechanical ones which have to be pre-set for each call.

6. Staff Location Systems

Although staff location systems are not, strictly, telecommunications, it is nevertheless convenient to deal with them in this chapter.

The problem of locating members of staff whose duties necessitate continual movement can be solved by choosing the correct type of location equipment to suit the prevailing circumstances.

Such equipment is of tremendous value in eliminating the time wasted by locating key staff and reducing the telephonist's load by making call-backs virtually unnecessary. With the introduction of subscriber trunk dialling (STD) over the whole country, the time factor in locating individuals is becoming increasingly important, as apart from causing irritation, waiting time is costing the caller money. Also, many people now leave their number when an individual is not immediately available and request to be called later. Staff location systems can help to reduce these costly call-backs.

There are three basic systems:—

Internal Broadcasting

A microphone is situated at the reception desk or adjacent to the telephone switchboard and when this is spoken into the resultant electrical signal is passed through an amplifier which increases the volume so that the announcement is broadcast over loudspeakers sited throughout the premises. The merit of this system for staff location purposes is that actual instructions can be passed to the person being located—for instance "Will the electrician please report to the machine-shop where an electrical fault has developed," or "Will the sales manager please report to reception where a visitor is waiting," or "Long distance call for Mr. Brown." In addition, the system is tailored to fit the building and acoustical problems are taken into consideration; hence, irrespective of whether 10 or 100 people are present, the system is just as effective.

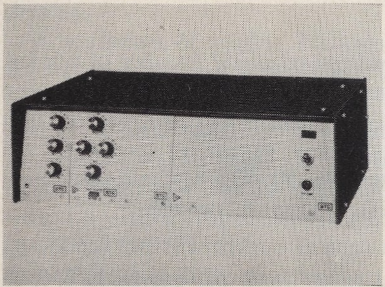
Many other facilities can be provided with public address systems once the basic loudspeaker distribution has been installed. These include music from radio, gramophone or tape recorder, alarm signals for emergency warning, time signals, intruder detection and a direct link with the internal telephone system.

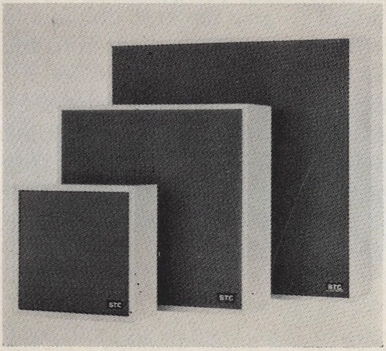
Microphones, amplifiers and loudspeakers come in a range of shapes and sizes to suit office, industrial, auditorium, outdoor and explosive hazard locations.

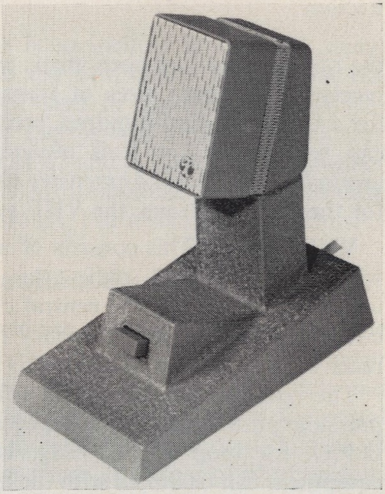
Pocket Paging

Pocket paging is a particularly suitable method of staff location for premises which require to maintain an atmosphere of tranquility, such as hospitals. In some cases they can be used by commercial organizations if the number of people to be located remains reasonably constant. The efficient operation of this system is dependent upon the construction of the building, for a large amount of steelwork will certainly produce "dead" areas.

The person requiring to be paged carries a small pocket receiver weighing about three to five ounces: when he is paged the receiver emits a high-pitched tone or "bleep." An ancillary lamp signal can also be incorporated in the receiver for use in locations where the "bleep" would not be heard. On some systems the receiver will accept speech transmitted from the central control, and in these circumstances the receiver has to be held close to the ear. "*Talk-back*" to the control can be offered by means of an additional transmitter attached to the receiver. All receivers have to be fitted with small batteries, either of the re-chargeable or the "throw-away" type.







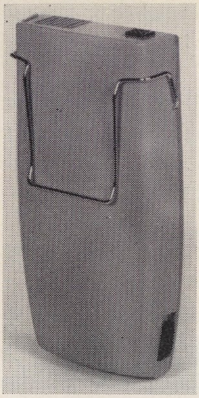
Internal Broadcasting Microphone.

Above, left:
Internal Broadcasting Amplifier.

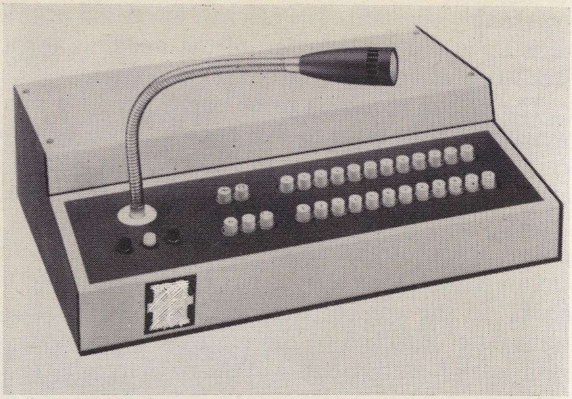
Below, left:
Internal Broadcasting Loudspeakers.

There are two basic types of installation to suit differing site conditions—namely, "*loop induction*" or "*VHF Radio*"—both of which require a licence from the G.P.O. While a licence for a loop induction system is comparatively easy to obtain, the process is more difficult in the case of VHF Radio as the G.P.O. lays down stringent conditions for this type of equipment.

Loop Induction: This system consists of a transmitter, usually situated at the telephone switchboard, a loop of wire encompassing



Radio Paging Receiver.



Radio Paging Console.

the buildings and/or open areas, and the requisite number of pocket receivers. Different sizes of transmitters can be provided to cater for a few, or several hundred, receivers. In special cases, up to 2,000 can be catered for. It is obviously very expensive to loop wire around open areas and extensive sites over 30–40 acres; consequently, for these applications, the VHF system is more suitable.

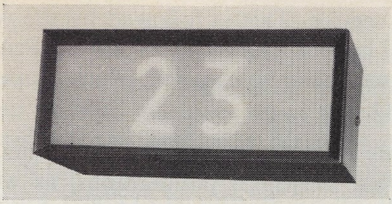
VHF System: This consists of a central control cabinet (encoder) wired to individual radio-type transmitters, and dipole aerials located remote from the central control to give the best obtainable coverage. Very High Frequency radio waves are transmitted to the receiver in question, thus causing it to "bleep."

The operator at the central control calls individual receivers by pressing push buttons, but speech messages are permitted by the G.P.O. for loop system only. In some cases the pocket paging equipment can be linked with the internal system, so that unanswered telephone calls are automatically switched to the radio paging system. Calls can be answered from any telephone.

Paging by Lights

This type of equipment is of value where both members of the general public and permanent staff are present on the same premises. A typical example is in a department store, where the general public must not be disturbed and yet floor managers need to be located quickly and quietly.

A keyboard is located at the reception desk and telephone switchboard and this is wired to multi-colour lamp displays distributed at visually significant points around the building. All personnel who need to be located are given an individual code, which may be different coloured signals or combinations including flashing codes.



Single Sided Light Signal.

To call a person the operator simply pushes requisite buttons on the keyboard and immediately the individual code is flashed throughout the premises. The wanted person, on seeing his code, lifts the nearest telephone and communicates with the telephonist or accepts a waiting telephone call.

As an additional safeguard, the lamp displays can be fitted with a soft-toned buzzer which attracts attention to the coloured lamp displays.

A variation of paging by lights is to include illuminated signal lamps, and buzzers if required, in the wall clocks throughout the building. Obvously clocks must be sited in conspicuous positions and so a dual function is served. Lamps will appear against any numerals with the usual exception of 12 and 6; hence a vast number of combinations can be obtained. An individual code in this case would not be a combination of colours, but a series of numerals.

7. Telegraphic Communication Systems

Whereas the systems so far described are methods of communicating the spoken word, telegraphy enables transmission of written or printed messages. Modern business and industry need quick and efficient communications, and extensive use is made of the postal and telephone services. Very often, however, written confirmation of orders or instructions is required, or plans, drawings or photographs are needed with the maximum possible speed. Graphic communication enables business organizations to direct or exchange such information with the absolute minimum of delay.

As with other sections of this chapter, the aim is merely to introduce the subject and its application to business and industry. Therefore, technical details of methods and equipment will be avoided as far as possible.

Methods

There are two principal methods used for transmission by electrical means:—

Printing Telegraphy: By this method the sense but not the actual appearance of the message is transmitted, and it employs the use of the teleprinter. Probably the most widely known application is the G.P.O. public telegram service. This is followed by the widely used, but perhaps not so well known, G.P.O. Telex service. Privately owned and maintained equipment can be installed, which is operated on lines hired from the G.P.O.

Facsimile Telegraphy: This method enables the exact image to be transmitted. Thus sketches, drawings, photographs, as well as printed or typewritten matter, can be communicated.

There are two methods employed, one by photo-scanning and the other by electro-magnetic means. Each will be described in due course. The equipment is privately owned, but operated over the public telephone network or by private installations.

The Teleprinter

The teleprinter has been described as a "telegraphic typewriter" which, when connected to another teleprinter by a pair of wires, or "line," can be used to transmit written messages over any distance.

A teleprinter is a digital device consisting of two main units:—

Keyboard: This translates key depressions into coded electrical signals that are transmitted to the local and distant receiver units.

Receiver: This translates the electrical signals into printed characters.

The keyboard of a teleprinter has a similar layout to that of any ordinary typewriter, and the depression of a key results in the

A Modern Teleprinter.

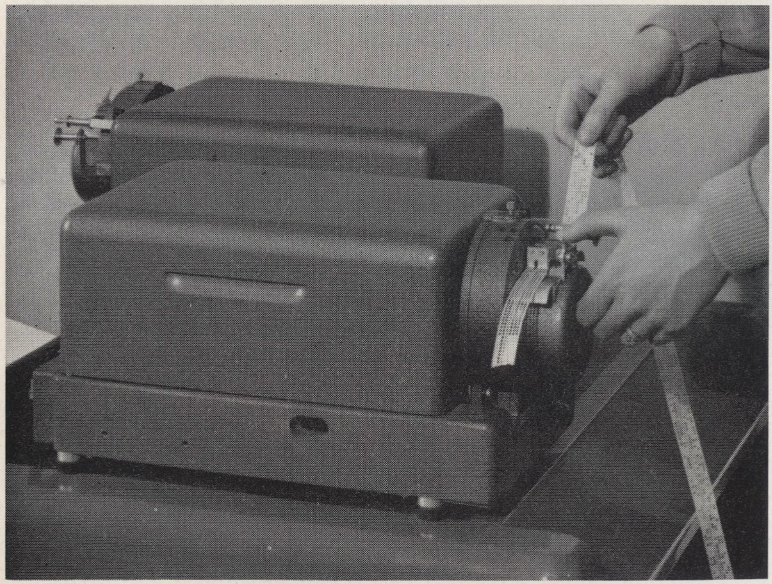
This machine both transmits and receives and is fitted with tape punch and tape reader units.

appropriate character being printed. In fact, since the electrical signals travel at the speed of light, the depression of a key on either of two connected teleprinters will result in the character being printed on both machines simultaneously.

Outgoing and incoming messages are printed across the full width of the paper teleprinter roll on both the sending and receiving machines, ready to be torn off for instant action.

Messages which include accounting details or statistical data can slow down an operator's sending speed. To ensure that such information is sent at maximum speed, punched tape can be employed. This requires the use of tape perforator and automatic transmitter.

Punched Paper Tape: This is the medium for recording messages for subsequent automatic transmission or local print-out. The advantage of punched tape is that, no matter how long it takes an operator to transcribe a message on to tape, an automatic transmitter can send the message to a distant station at a steady speed of up to 100 words per minute. Suppose, for example, that a teleprinter link between London and Glasgow is being used to pass information in one direction only. The amount of traffic that can be handled in any given period would be dependent upon the speed of the operator concerned. The average speed is between 40 and 50



Automatic Transmitter.

Also known as a tape reader. The use of punched paper tape enables messages to be sent at the fastest possible speed.

words per minute which, allowing for flat out, uninterrupted operation would result in an hourly transmission rate of between 2,400 and 3,000 words. However, few operators are capable of sustained operating speeds of this level and 2,000 to 2,500 words is a more reasonable hourly transmission rate. Where a high traffic level is necessary, this can be achieved by the use of punched tape equipment. Separate operators, each equipped with an "off-line" (not connected to any other machine) keyboard perforator, can produce tapes which may then be fed to a single automatic transmitter. This transmits the tapes at up to ten characters per second—100 words per minute—to give a maximum hourly output of up to 6,000 words.

Basic Units: A wide range of machines, accessories and special facility extras is available, and an almost limitless number of permutations of these is possible to meet practically any communications requirement.

The following are the basic units from which most systems are built up:—

Teleprinter Receiver: The receiver-only teleprinter is used in those installations where copy is to be received but not transmitted. The machine can be left completely unattended and will switch itself on and off automatically.

Teleprinter Transmitter-Receiver: This is a two-way machine which is capable of transmission and reception of messages. It is available with three or four row keyboard and a wide range of extras and accessories.

Reperforator Attachment: This can be supplied fitted to a teleprinter to provide punched tape record of incoming or outgoing messages or to produce tapes for subsequent automatic transmission.

Tape Reader Attachment: Another attachment for the standard teleprinter, this unit can read pre-punched tapes at up to 100 words per minute for automatic transmission to a distant station or for local print-out. Machines can be fitted with both tape reading and reperforating attachments.

Printing Reperforator: This machine is similar in many ways to a teleprinter transmitter-receiver with reperforating attachment. The difference is that it produces the print-out and punched tape on one length of punched and printed paper tape.

Keyboard Perforator: This machine is always used "off-line" (not connected to a signalling line) to produce punched tape. It can operate at up to 140 words per minute, although the usual operator speed is around 35 to 45 words per minute, except for short keying bursts of speed.

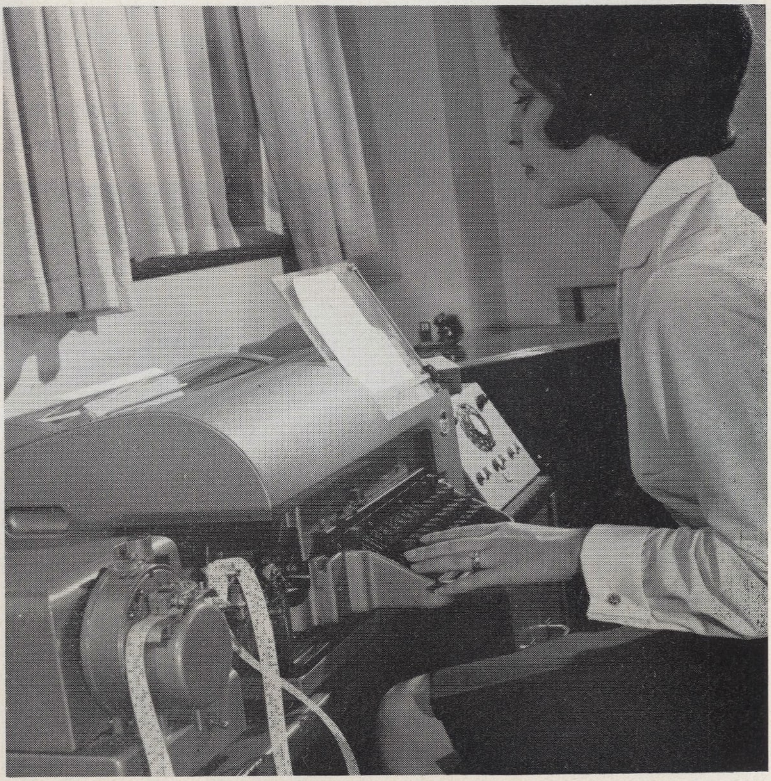
Automatic Transmitter: Identical in function to the standard teleprinter tape reader attachment, this machine is used when operating conditions demand a that separate transmitter be used.

Teleprinter Desk: This mounts teleprinter and ancillary equipment and has accommodation for power equipment, all connecting units and switch equipment where necessary.

G.P.O. Telex Service

The telex service is designed to provide fast and reliable communication in print, in this country and to many countries overseas. Subscribers have their own teleprinters, dialling units and desks, and each installation is connected by a direct line to an automatic telex exchange.

These exchanges can connect any telex subscriber to any other telex subscriber in the country, in just so much time as it takes to dial a number. Calls to telex users in certain other countries are



Typical GPO Telex Installation.
The dial unit is on the right of the teleprinter and the automatic tape transmitter on the left.

directly dialled by the subscriber, while others are switched to the International Telex Exchange in London, which has access to the entire world-wide telex network.

Each subscriber has a telex number and an individual identification signal, known as an "*answer back code*", both of which are published in the United Kingdom telex directory.

Telegrams and all types of messages from personal greetings to tabulated data can be sent by telex. Rental is, of course, higher than for the telephone service, but there is no installation charge. Charges for calls are made in fixed price units, and the amount of time bought for the unit is dependent on the distance of the call.

Private Systems

With private systems, a company buys, installs and operates its own equipment and hires the necessary lines or wires from the G.P.O., which takes responsibility for maintenance of the circuit.

The press and news agencies in particular are major users of such systems, but an increasing number of commercial and industrial firms are now using the system to speed the exchange of information.

Photo-scanned Facsimile Transmission

This system provides for the transmission and reception of drawings, graphs, weather charts, letters, invoices, manuscripts, signatures,

Private Wire Telephone System.
This can be used to link two or more locations miles apart or in the same building. Here an operator types out a message which . . .

. . . is being received on a receiver only teleprinter many miles away. Instant communication such as this speeds the flow of information in companies with widely scattered locations.

etc., over a public or private telephone network. With the latest equipment, it can also transmit over long-distance radio links.

A typical system consists of a transmitter, connected to the telephone by a switch, and a receiver at the distant end, also connected to the telephone by a switch.

To transmit a document, a telephone call is made in the normal manner. When contact is established both the switches are pressed and facsimile communications may begin.

The operation of equipment is quite simple. The leading edge of the document to be transmitted is inserted into the machine, transmission then takes place automatically.

The recorder starts up automatically, adjusts the signal to compensate for any losses in the telephone line and records the copy.

When the document has been scanned, the transmitter automatically reverts to stand by and the recorder switches itself off.

The recorder requires no manual attendance whatsoever. The received facsimile is suitable for reproduction by any commercially available copying machine should additional copies be required.

The elementary principle of operation is as follows:—

The Transmitter: The leading edge of the document is inserted into the machine and a strip of the document is brightly illuminated. An image of this illuminated strip is focused on to an optical slit through

Photo Scanned Facsimile Transmitter and Receiver.

a folded optical system using a mirror and lens. The optical slit allows light from a small strip of the image to pass to a rotating drum fitted with a second optical slit in the form of a helix.

The combination of fixed slit and rotating helical slit produces a moving aperture which scans the image of the illuminated strip of document. A light-guide inside the rotating drum directs the light from an elemental area of the image on to a photomultiplier cell. Variations in the brightness of the image, cause the photomultiplier cell current to vary, and these variations in current are amplified to provide the output signal from the transmitter.

The Receiver: The signal arrives over the telephone line from the transmitter and is converted to a form which can be applied as a varying electrical current to the marking contacts of the recorder. One contact is a stationary writing edge, the other is a rotating helix, and together they create a moving point of contact across the electrostatic recording paper. The paper is continuously passed up between the writing edge and the helix, and marking is made according to the amount of current flowing through the moving point of contact. By this means a line-by-line reconstruction of the original copy is obtained.

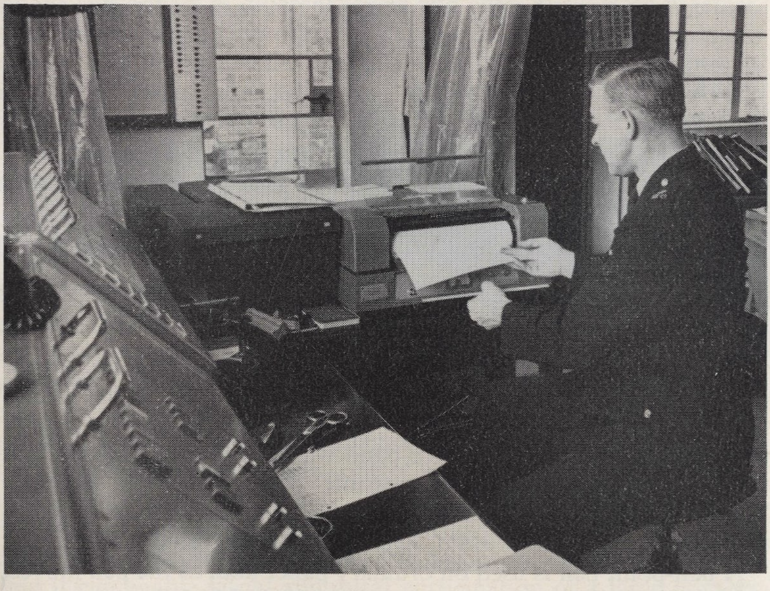
Synchronizing: To ensure that the transmitter drum and receiver helix rotate in synchronism, their respective drive motors are supplied with power at the same frequency. This frequency is normally that of the a.c. power supply, provided that the power supplies at the transmitter and receiver are synchronized. For use in cases where the power supplies are not synchronized, crystal-synchronized types of transmitters and receivers are available. In these instruments, the speeds of the transmitter and recorder are controlled from highly stable crystal oscillators which are adjusted to have the same frequency within a few parts in a million.

Speed: The transmitter will accept documents of any length up to a maximum of 8⅝ in. wide. The standard machine for use on public telephone and private wire circuits will transmit at the rate of 30 seconds per inch of copy.

For standard typewritten copy, over 1,000 words can be transmitted at a rate of 150 words per minute. This is 2½ times faster than the teleprinter, which of course demands skilled operation.

For systems working within offices or factories over distances up to ten miles, much higher speeds can be achieved. Five and a half inches of copy may be transmitted in one minute.

Applications: This equipment is used extensively for varied purposes, examples being: transmission of data, weather charts, printers proofs, corrected copy etc., airline reservation details and



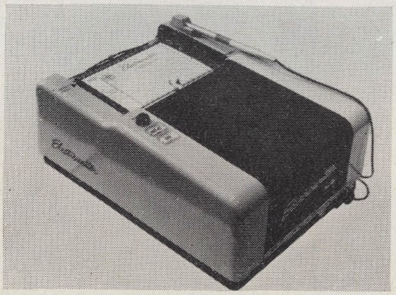
A Transmitter Being Loaded with Copy at a Police H.Q. for Transmission to Divisions.
The "concentrators" on the left of the picture enable a number of transmitters to be connected to a combination of receivers.

tickets, news items, bank statements, criminal records, lists of stolen vehicles, details of missing persons, etc.

Electro-mechanical Facsimile Transmission

Unlike true facsimile equipment that has been referred to as photo-scanned reproduction of original data, this method of transmission enables one to write to other points by a remote controlled pen. This is done by creating two frequencies transmitted down a pair of wires compositely, one frequency being governed by a horizontal movement and the other by a vertical movement, so that the machine responds to varying frequencies, unlike a teleprinter which relies upon single pulses.

A *Receiving* unit has a mechanical response to a varying frequency on the line. The input is filtered in such a way that it splits the composite signal into two distinct frequencies, each of which is then able to operate the vertical and horizontal pantograph motors, which in turn operate the pen. The action of the nib is achieved by adding a further signal to the horizontal frequency. This is then detected and converted into pure d.c. to operate a solenoid which, by mechanical linkages, causes the pen to touch paper. This sequence of events is touched off at the *Transmitter* by the operation of a gravity switch within the stylus, and thereafter by a spring-loaded plunger which operates the pen-down mechanism.



Electro-Mechanical Fascimile Transmitting/Receiving Unit.

The receiving machine is inactive until a signal appears at the input, thus operating a signal-sensing and bringing the whole machine into "receive condition." As both vertical and horizontal frequencies are within the voice band width, it is then obvious that whenever voice reception is possible this system will operate. Therefore the machine can transmit written messages or sketches to any point, however distant, over telephone or radio circuits.

A ball-point pen is used on ordinary paper and, as the pen moves, the remote receiver(s) instantaneously and faithfully reproduces the copy as it is written. No extraneous power supplies are required. The instruments are self-contained and fully transistorised.

These instruments can be attached to the telephone system, permitting alternate written message and voice service. Messages between stations will pass automatically through a dial exchange, in the same manner as telephone calls.

They can also be used in any combination over leased or customer-owned lines of any distance with or without associated telephone sets.

Appropriate signal lamps are provided to indicate "power on," "transmit" or "receive" conditions, and "busy line" conditions.

8. Radio Telephony

Radio signals have been successfully transmitted commercially since the turn of the century, but speech transmission by radio communication has been commercially possible only since the first world war. From 1919 onwards there were all kinds of exciting sounds to be picked out of space—ship to shore stations, aircraft talking to control towers and experimental broadcasting stations. By 1926 the first radio telephone link with the U.S.A. was established for public use; in the following years radio links were made with many countries, and today radio channels span the world.

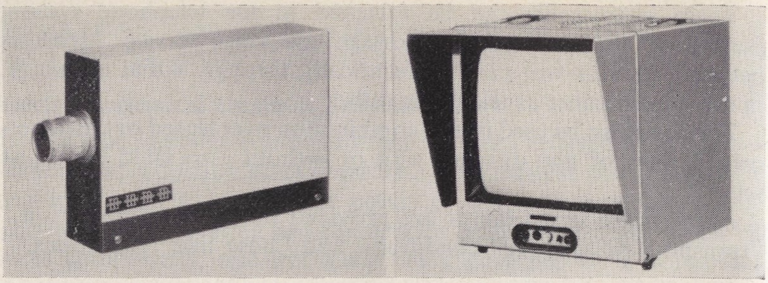
Not only long distances are spanned by radio circuits, for increasingly radio is being used instead of cables to connect telephone subscribers in different towns and cities fairly close together. Over difficult terrain it is often the only way of establishing communication, but between cities such as London and Birmingham the number of circuits needed is so great that it is easier to provide radio links than to lay huge cables.

Telephone calls from moving cars and trains are also commonplace by the use of radio telephony.

9. Closed Circuit Television

Closed circuit television is a method of transmitting television pictures within a private network. Exactly the same principles are involved as in public television, but the transmitted signal is sent over private lines to the receivers and not broadcast into the ether for all to receive. Pictures can be transmitted from studios or from outside locations. Cameras can be manually operated or fully automatic, with remote control which allows them to be used under almost any conditions.

This is a very expensive medium of communication, but it has considerable potential in certain circumstances. In the educational field it can enable visual and aural participation of a large number of people where physical participation would be impossible—*e.g.*, in connexion with surgical operations, microscopic study, etc. It



Closed Circuit TV Camera and Monitor.

is also a valuable aid for remote control of an activity where it is impracticable or undesirable to involve people. For example, traffic control can be achieved by one man having access to television pictures taken at a number of points.

Security is another important field where closed circuit television can be invaluable, and it is widely used in prisons, supermarkets, etc.

10. Video Telephones

The ablity to see the person to whom you are talking on the telephone is a development of communications which will no doubt become commonplace in a few years. Successful experiments have already been made in this country, and in America videophones are already a standard facility in several big cities. The rapid advance of micro-miniaturisation of electronic components will solve many problems involved in this form of communication.

11. Satellite Communication

Normal radio communication depends largely on the transmitted radio energy being reflected back to earth from the ionosphere and being picked up by a receiver. For technical reasons this has serious limitations, especially as the ionosphere ceases to reflect radio energy at very high frequencies. Therefore a man-made device which can be put into space and used to reflect radio signals at all frequencies would be an ideal form of communication.

Such a device or satellite could be either a passive reflecting surface—*e.g.*, a balloon—or an active satellite containing equipment to amplify the radio signal before transmitting it back to earth. So long as such a satellite can be seen by both transmitting and receiving station, permanent communication is possible.

Passive satellites were used experimentally many years ago, but the first active satellite, Telstar, was put into orbit in 1962 and since then has been used to carry telephone conversations and television broadcasts between America and the western continent of Europe daily. There is no doubt that a number of satellites will eventually ring the earth, enabling all countries to communicate with each other at all times.

12. British Standards

Most telecommunications equipment is manufactured to agreed specifications and standards. The International Telegraph and Telephone Consultative Committee (C.C.I.T.T.) issue recommendations to which most public communications systems in the world conform, enabling world wide communications to be achieved without difficulty. In Great Britain the Post Office lay down specifications for all equipment manufactured for them and also for all private equipment which is used in conjunction with public services. There are also a large number of British Standards which apply to materials used in the telecommunications industry. The technical nature of these standards and specifications are such that inclusion of them would serve no useful purpose for the requirements of this book.

Mechanical Intercommunication Systems

In addition to the need for communicating by systems described in the previous chapter, there is also a need for getting documents, samples, small spare parts and other articles from one department to another. Obviously this can be done by messenger, but mechanical methods are available. These allow messenger services to be considerably reduced or cut out altogether, thereby saving time, labour and cost. They also obviate the risk of items being lost in transit. Such advantages can be important for small and large concerns alike, and in fact wherever notes, drafts, letters, drawings, plans, advice notes, punched cards, blueprints, files, etc., are in use there is generally a need for some means of mechanical communication. As with other methods, the field is a specialist one, and no attempt will be made to deal with the subject in detail. The systems can be conveniently divided into several main groups.

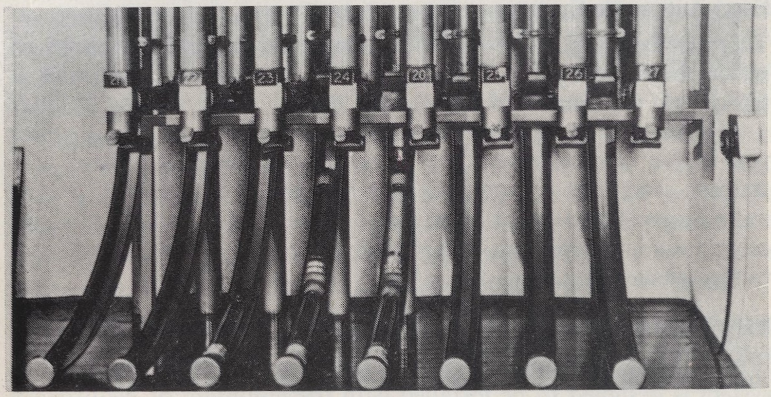
1. Pneumatic Tube Conveyors

With this method, the document, sample, etc., is placed in a cylindrical or rectangular-shaped carrier, which is then placed in an air tube for dispatch to its destination. The system operates by the employment of an air exhauster connected to the tubes. A vacuum is created which pulls the carrier through the tube. In some cases, such as steel sampling where speed is important propulsion is by air pressure. Any distance can be crossed and any difference in elevation negotiated. The tubes cover the route by the shortest distance, may be placed underground, overhead and through wood, brick, concrete, steel or other building material. The carriers are made from plastics, steel or aluminium, in a variety of sizes (usually $2\frac{1}{4}$ in., 3 in., 4 in., or $5\frac{1}{2}$ in. in diameter and some rectangular sizes). Special inserts allow their use for liquid or solid materials. They travel through the tube at a speed of up to 30 ft. per second. With air pressure the carrier speed can be increased up to 70–75 ft. per second. Basically there are four types of installation.

Independent or Point-to-Point System

This system consists of a pair of tubes connecting two points, one for traffic in each direction; this allows uninterrupted flow in both directions and the fastest possible service. These systems offer complete security because of their "one line, one destination" feature. They operate on simple mechanical principles and, apart from the motor connexion, require no special electrical wiring.

Where a concentration of traffic occurs at a central point, lines can be grouped to radiate from this point to form a multi-station independent system. Intercommunication between out-stations can be achieved by setting indicator rings on the body of the carrier. On arrival at a central exchange the carrier is manually redirected to the indicated out-station.



Manual Exchange of an Independent or Point to Point System.

There are few restrictions on the type of out-station and exchange which can be provided with independent systems. It is usual to use pneu-art terminals where quietness is important, and metal chutes where it is vital that the arrival of a carrier is immediately evident.

The vacuum required to move the carrier through the tube is provided by a power plant located at either end of a "point to point" system or adjacent to the central exchange in a multi-station system.

The widest possible range of carriers, including side-opening, open-ended and end-opening types, can be used with this system.

Variants of this system are as follows:—

Vacuo-Pressure: The vacuo-pressure system consists of one line in which the carrier travels one way under suction, the other under pressure. This can be used where there is light traffic over a great distance and where the use of two tubes would be uneconomic.

Pressure: The pressure system consists of one line in which the carrier travels in both directions, but under pressure. This is used particularly where high speed over long distances is necessary, as in the case of steel sampling in steel works. Special terminals are used for cushioning the arrival of the carrier.

Semi-Switch: This type of system can be employed where two stations are required on one line and are located at a distance from the main station or exchange. A simple switch introduced on the outgoing line and operated by a metal-bodied carrier allows the carrier to discharge at the first station. A plastic-bodied carrier passes through the switch to discharge at the second station. Return of carrier from both stations is effected by a common return line to the main station or exchange.

Semi-Automatic System

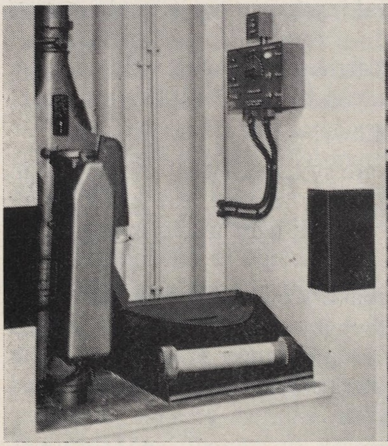
This type is designed for the application that demands a centralized service or control point and yet where space in service ducts and at the central exchange is at a premium.

A number of out-stations are situated on a loop of tubing which provides a common line for receiving and sending. These out-stations send to a central exchange situated at the ends of one or more loops. The destination of outgoing carriers is controlled at the central exchange by push-button which operates a deflector adjacent to the selected station.

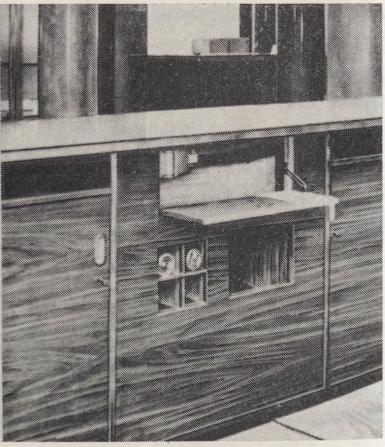
Ring Main System

For automatic intercommunication between departments, this system is designed to be installed with the minimum of disturbance and is therefore particularly suitable for existing premises. In general, it is most applicable to a fairly compact area where the traffic frequency between stations is evenly distributed.

All ring main systems are fundamentally similar. A single tube winds its way from station to station throughout the whole building or group of buildings, returning to its starting point to form a complete circuit or ring. Carriers are accepted into this ring and



Vertical Receiving and Sending Station on a Ring Main System.



Horizontal Receiving and Sending Station on a Ring Main System.

travel round it until they are discharged automatically at the required destination.

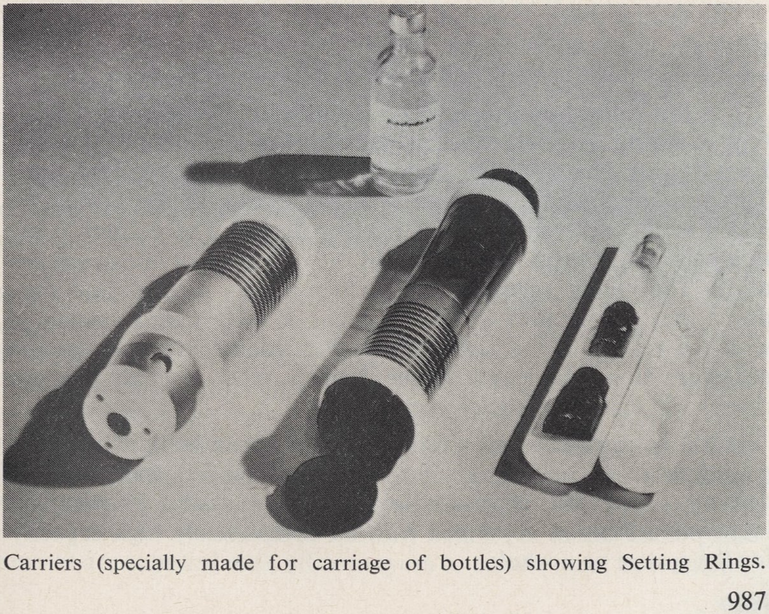
The sending and receiving points for each station form culs de sac leading off the main road of the ring main. Carriers entering the circuit are prevented from colliding with others already in the line; an automatic sending unit ensures this by not releasing a carrier from the station until the circuit in the vicinity is clear. On reaching its destination, a carrier is deflected from the circuit, the system reverting to its normal state immediately the carrier has discharged.

There are two types of ring main which differ electrically in the method used to determine the destination of the carrier.

Station-controlled: By turning a dial at the station, the deflector at its destination is operated. Signal lamps indicate the transit and arrival of carriers and the dial at the dispatch station shows the designated receiving station. Any out-station that is unattended at a particular time can be isolated at will, and carriers sent to that particular station are automatically re-routed to a master station.

Carrier-controlled: This is operated by the carrier through selector rings on the body, in the manner of the pre-selector system (see over). As the carrier approaches its destination, these rings complete a local electrical circuit to operate the station deflector.

With systems not exceeding 14 stations, and dependent on certain characteristics of the tube layout, a self-homing device can be incorporated which permits carriers to be returned to home stations without re-dialling.



Carriers (specially made for carriage of bottles) showing Setting Rings.

Pre-selector System

Where automatic intercommunication demands a high traffic capacity, with wide variations in traffic loading at individual stations and departments, this system is designed to meet these fluctuations. The system can be readily installed in existing premises without undue disturbance to the building.

The pre-selector system has two tubes passing each station, one for despatching and the other for receiving carriers. All carriers pass through the centrally situated automatic exchange. Here carriers are spaced out to avoid catching up with each other on the station receiving line.

Setting rings on the body of the carrier operate the station switch through a brush selector located before each station on the receiving line. The arrival of a carrier at a station can be indicated by a signal light. Indicator lights at each station on the sending line control any possible overloading of the system.

A reject station is incorporated in every system to receive misdialled or faulty carriers. This station should be manned while the system is in use.

Carrier Automatic Routing Exchange

Systems of this type also use address rings on the carrier body. These electrical contact rings are lettered and numbered and permit up to 256 different destination addresses.

The system differs from all other techniques in that the contact rings are not read while the carrier is moving but are subject to precise and positive detection techniques at a central exchange.

It is this central exchange which is the main characteristic of this type of system. A single tube can pass through a number of stations. Each station has a simple door in this common collecting tube. This tube terminates in a short vertical section at the bottom of which is the electromechanical reading device. The carriers come to a halt and, if there is a number of them, will stack one above the other. The reader examines one carrier per 2½ seconds and then drops that carrier into a delivery tube. A relay board associated with the reader, is fed signals from the reader, and operates the deflectors along the length of the delivery tube, in order that the carrier will emerge at the correct station.

It will be apparent that a central exchange can be built up comprising, say, six collecting tubes with their readers and, say, six delivery tubes. The characteristic of such a system is complete intercommunication combined with an exceptionally high capacity for the system as a whole.

2. Document Conveyors

These systems are used for conveying loose papers or pocket files between a series of desks in an office where routine processing is required or between a number of offices. Conveyors capable of handling documents both horizontally and vertically can be used where offices are located at different levels.

Belt Conveyors

These are usually employed where documents require to be transported in a straight line between a number of points. There are two types.

Flat Belt: This is simply a canvas belt, electrically driven on rollers between guard plates. It is for horizontal use only.

Sandwich Belt: As the name suggests, this consists of two belts running at the same speed, in which the documents are "sandwiched" for security. Therefore the system can be used where vertical or horizontal turns and rises are necessary. Intermediate entry and discharge points can be provided by separating the belts.

Narrow Belt Trough Conveyors

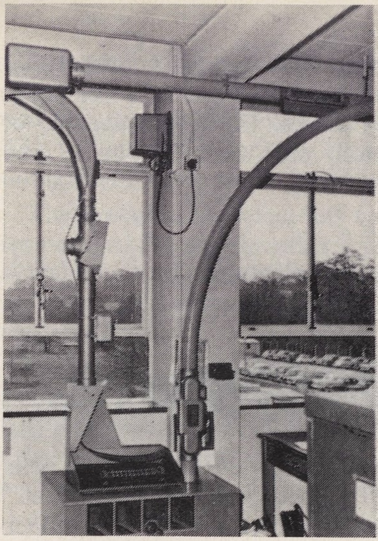
A narrow belt at the base of a trough carries papers on edge. For movement in more than one direction multi-lane conveyors can be built up to suit specific requirements.

Discharge of papers is normally at the end of the conveyor into a receiving tray, but where necessary the outside lanes may be "ploughed off" sideways into a tray at any point along the length of the conveyor. Temporary stops can be inserted in a lane so that a number of processes can be carried out at different points on the same lane.

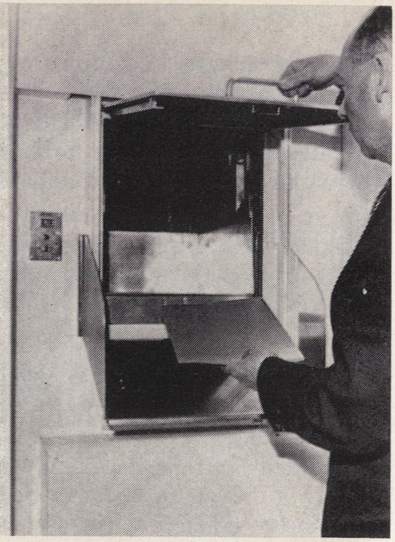
Where a change of direction in the horizontal plane is necessary, corners can be incorporated, but this is dependent upon the nature and characteristics of the documents.

These conveyors can be designed to transfer papers to a sandwich belt conveyor for conveying them vertically to another level, discharging either into a receiving tray or on to another narrow belt trough conveyor on the other level. This conveyor is usually available with three depths of troughs (3 in., 5 in. and 7 in.). Papers should not protrude above the top of the trough more than one third of their total width, otherwise traffic flow may be retarded. Sizes are made up in standard lengths, which facilitate speedy delivery and installation of a conveyor to any specified overall length.

They can be manufactured with any number of lanes. Three-phase motors are supplied with all conveyors to ensure quiet operation.



Pre-Selector System Station.



Document Lift.

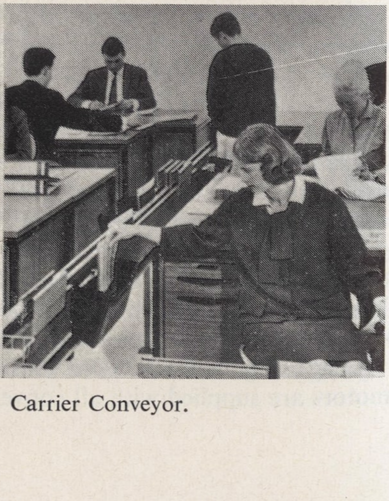
Carrier Conveyors

This system is similar to the previous system, except that flat plastic moulded containers are used to hold the papers. These are placed on a belt running in a trough. The setting of a device on the container allows destination selection. Vertical and horizontal operation is possible.

Drag-band Conveyors

The drag-band is designed to carry papers gripped by a moving belt against a polished ribbed metal track. It can turn vertically and

Single Lane Narrow Belt Conveyor.



Carrier Conveyor.

horizontally and intermediate entry points can be allowed for. It is intended primarily for the handling of single sheets of paper, which are not likely to be damaged by the sliding action of the drag-band.

Kick-back Conveyors

This is a simple form of overhead wire system designed to carry documents in a suspended "car" in one direction only. The car is catapulted along a taut wire to its station, where the contents are discharged automatically, and then returns by gravity to the dispatch point.

3. Document Lifts

Manually or electrically operated document lifts are used for the movement of mail, books, files, parcels and similar loads, between stations situated vertically above each other. They provide a simple means of distribution in multi-storied buildings which saves the time of messengers and reduces the traffic in passenger lifts.

Size, capacity, loading, and speed will depend upon model and requirement.

Lifts are available which automatically take up or discharge their loads on to horizontal conveyors, the load continuing to its destination by automatic reading of its address.

Time Recorders

An accurate time recording system is an essential installation wherever a labour force is employed, be it small or large, for purposes of time-keeping, reducing loss of time, and providing time and job records, etc. Records thus obtained obviate time disputes and generally facilitates confidence and improved staff relations.

1. Brief History

Early in the eighteenth century, time recording was accomplished by means of numbered checks. Each employee simply deposited his check into a box which was removed at a particular time and replaced by a late box. Alternatively, the checks were hung on a check board which was also replaced by a late board at the appropriate time. Such methods, and many others subsequently introduced, depended for accuracy upon the time-keeper, and even upon his integrity, consequently, records were often the subject of dispute. One attempt to provide a more reliable record involved clockwork control to close the aperture of the check-box at the required time.

The printed record was introduced towards the end of the nineteenth century. In 1885, W. L. Bundy with the aid of his brother, invented in America, a watchman's clock that was subsequently developed in 1890 to record employees In and Out times. The principle, still in use today, utilized individually numbered keys to produce a record of the key number against the time, on a continuous roll of paper. As the registrations were in employee arrival order, analysis of the record was necessary for purposes such as pay-roll preparation.

Dial or radial time recorders were also introduced about this time. Invented by A. Dey in this country, the patent was developed by his brother in America in 1892. Each employee was allotted a number and moved a metal arm on the machine round a dial until it was positioned against a hole with the corresponding number. On depression of the arm a printed record of the time was made on a sheet of paper. All registrations of time were against the employees number thus obviating further analysis. However, the disadvantage with these recorders was in the limitations of number of employees that the machine could register.

Time recorders producing individual employees records on separate time cards were marketed in this country in 1898, having been invented by D. Cooper in America a few years earlier. They very quickly became the most popular method of time recording—a position they still hold.

All early recorders relied for their time-keeping on spring-driven clock movements—usually with pendulums—which were wound by hand. Today, although spring-driven mechanisms are still used, the emphasis is on electric control and systems operating through a Master Clock that ensure complete uniformity of time throughout all clocks, recorders and other time control units connected to it.

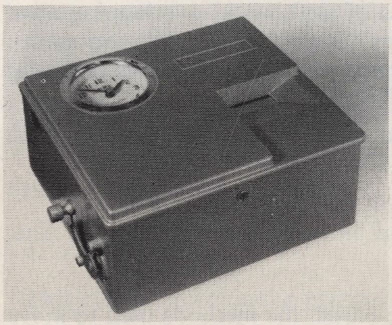
On a subject of this magnitude, it is possible to give only a general outline of the principles, uses and operation of the types of recorders most widely in use at the present time.

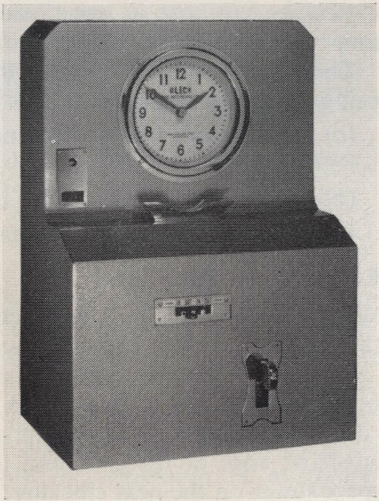
It should also be realized that, although at first glance several machines do the same thing, they nearly all have variations in the type of records produced, the method of operation, etc., which enable each of them to fulfil a particular need better than their counterparts.

2. Signature Recorders

These are used in offices to record times of arrival and departure of clerical workers, in road transport depots, where it is essential to record arrival and departure time of long-distance drivers, and in unsupervised stores, warehouses, etc., where there is danger of one worker clocking on for others.

On depression of a handle at the side of the machine, the recording mechanism prints the day, hour and minute and simultaneously a shutter slides back to allow the operator to sign on the exposed section of a continuous roll of paper against the printed time details.





(*Above*) Signature Recorder.

(*Right*) Card Recorder (Time-based.)

When the handle is released, the shutter covers the aperture and the paper moves round one space ready for the next signature.

The roll, which can be removed only by the authorized official having the key, will take about 1,000 signatures.

3. Card Recorders

All card recorders work on the same principle. A time-card is placed in the card receiver and the time is stamped on the card by the machine. Various means are then used to move the card so as to obviate overstamping.

Recorders print, according to type and model:—

(1) Month, day (or date), hour and minute;

(2) Day (or date), hour and minute;

(3) Hour and minute only.

Although there are several manufacturers, each producing a range of models, most of which utilize cards of different print registration and dimensions, time recorders fall into two distinct catagories:—

Time-based Recorders

On time-based models the card is automatically lifted, at predetermined times, to separate a.m. and p.m. clockings and/or one day's clockings from another's. The mechanism which effects the sideways movement of the card is operated manually on some models and automatically on others.

Owing to the set time operation of the card lift mechanism, difficulties can arise in some cases of shift work, overlapping meal times and overtime clockings.

There are several variations of this type of machine, three examples being machines which—

(*a*) lift the card twice a day and allow for four clockings on each line;

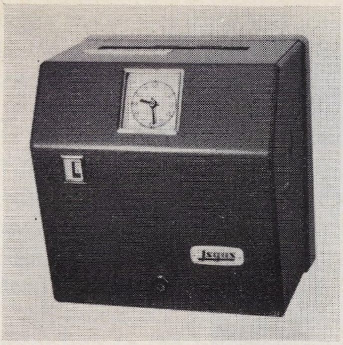
(*b*) allow more clockings per line if a wide card is used;

(*c*) lift the card once a day and allow for six clockings per line.

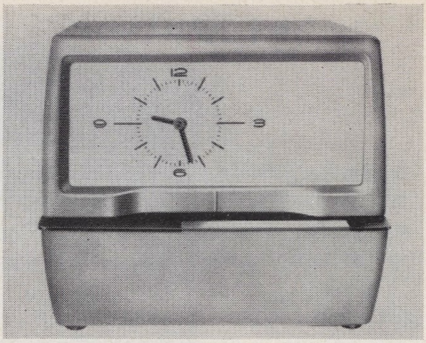
Recorders not Time-based

With recorders which are not time-based, the methods used to move the card into correct stamping positions vary.

The clip type of machine has a fixed card-foot immediately below a cutter, set to operate on the extreme left-hand edge of the card. Every time a stamping is made, the cutter clips a piece off the left-hand edge of the card and thus enables the card to sink one space lower on the next clocking.



Perforator Recorder.



Job Coster.

On the card used with this machine, clockings are recorded one beneath the other in either one or two vertical columns. On the two-column model, the column-shift can be either manual or automatic.

Other types of recorders use holes punched in the card by the machine at the time of stamping as a means of correctly positioning the card.

One model punches a hole on the left-hand side of the card when a stamping is made, and this is located by a seeker-pin in the machine to ensure that the card is correctly positioned the next time it is used. Clockings are recorded in a single vertical column on the card used with this machine also, but, as distinct from the clip type, both faces of the card can be used.

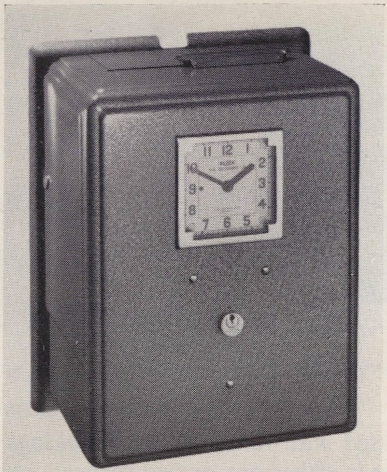
Another model, which uses punched holes, records clockings in seven vertical columns, one for each day of the week. Using the same principle of utilizing the previous hole for correct position of the card vertically, the sideways movement of the card required to bring it into correct day position is effected automatically at predetermined times.

This type of machine is often used for the dual purposes of timekeeping and job costing.

4. Job Coster

This type of machine is primarily intended for the successful functioning of job costing systems. Generally speaking, they are designed to print on the right-hand edge of cards or work-sheets, which can be of any size. There are no card receivers on this type of machine, the card being pushed into a horizontal, open-ended slot in the front of the machine and correctly positioned for stamping visually.

Recordings are made manually by depression of a stamping handle or automatically, according to the model.



Punch Hole Recorder.

5. General Facilities

Most recorders are available—

1. with optional two-colour printing facilities for recording lateness, overtime, etc., in red;
2. with choice of three forms of drive—*i.e.*, 8-day spring-wound movement, synchronous A.C. mains drive, operating direct from the electricity supply or impulse-operated through a master clock system; and
3. with sound signal attachments, for operating warning bells, buzzers, hooters, etc., for starting and finishing work times and tea breaks.

6. Master Clock Systems

These are designed to ensure that all time, whether visual or recorded, is consistent throughout the premises.

One type operates through accumulators, which are trickle-charged to supply a power reserve to the whole system in the event of a mains failure.

Another type operates direct from A.C. supply mains but has a spring-wound reserve which keeps the master clock going during a power cut and, immediately power is restored, rectifies time lost by subsidiary equipment during the cut.

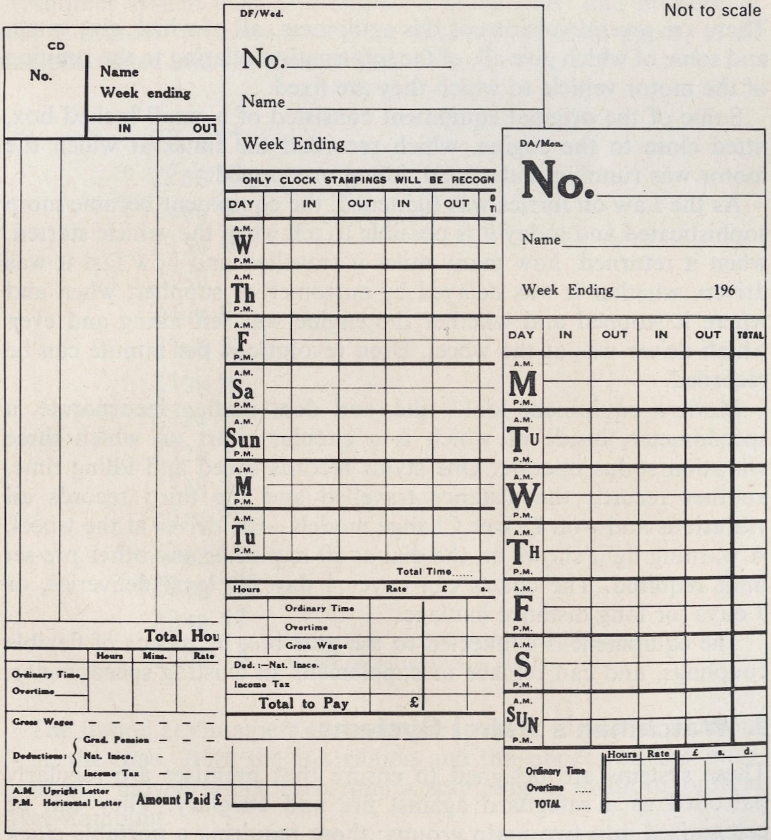
Also operating direct from A.C. mains supply, a third type has a spring-wound reserve which controls subsidiary dials individually when the power supply is normal and can be additionally adapted to incorporate the correction of subsidiaries after a power failure on the lines of the type mentioned above.

7. Time Clock Cards

Time recorder cards have to be produced to accurate measurements from board which is specially manufactured to specifications that have been laid down by time clock manufacturers, and printing and cutting of this material must be absolutely accurate in order to give dead register in the time clocks.

All time clock manufacturers have standard widths for time cards, according to the model of clock used, and they do allow the time card manufacturers a very small tolerance over and below the standard width. This is 1/64th in. on some widths and styles and as little as 0·005 mm. on others.

Not to scale


CD
No.
Name
Week ending
IN
OUT
Total Hou
Hours
Mins.
Rate
Ordinary Time
Overtime
Gross Wages
Deductions:
Grad. Pension
Nat. Insce.
Income Tax
A.M. Upright Letter
P.M. Horizontal Letter
Amount Paid £
DF/Wed.
No.
Name
Week Ending
ONLY CLOCK STAMPINGS WILL BE RECOGN
DAY
IN
OUT
IN
OUT
A.M.
W
P.M.
Th
F
Sa
Sun
M
Tu
Total Time
Hours
Rate
£
s.
Ordinary Time
Overtime
Gross Wages
Ded. :—Nat. Insce.
Income Tax
Total to Pay
£
DA/Mon.
No.
Name
Week Ending
196
DAY
IN
OUT
IN
OUT
TOTAL
A.M.
M
P.M.
TU
W
TH
F
S
SUN
Hours
Rate
£
s.
d.
Ordinary Time
Overtime
TOTAL

Examples of Time Clock Cards.

This shows the very fine limits that the time card manufacturer has to work to, and, in order to obtain these very fine limits, accurate cutting is essential. It is also very essential that the grain of the material shall run from top to bottom.

Buff manilla is the most popular quality, but white and a small range of colours are used and very often these colours are used for identification between departments or factories.

It is essential that time cards are stored in an even temperature, as a damp, humid atmosphere would find the cards absorbing moisture and consequently swelling. This would mean that they would not fit accurately into the slot of the recorder.

If they are stored in an atmosphere which is too dry, they will contract because they lose moisture; consequently the clock stampings in the recorder will not fall accurately into the spaces provided.

8. Vehicle Time Recorders

There are several versions of this equipment, all of which give some, and some of which give all, of the information relating to the running of the motor vehicle to which they are fixed.

Some of the original equipment consisted of a small locked box, fitted close to the engine, which recorded the times at which the motor was running under load, idling or stopped.

As the Law on lorries was tightened, the equipment became more sophisticated and today it is possible to tell when the vehicle started, when it returned, how many miles it travelled and how fast it was driven, whether it was delayed by customer or supplier, when and where it stopped and whether the engine was left idling and even which driver was at the wheel. Even revolutions per minute can be recorded.

Modern equipment looks like, and does in fact incorporate, a speedometer, inside of which is a circular chart on which three vibration stylus operate. One stylus records speed and idling time, another records the distance travelled and the third records all vibrations and—on Driver Change models—the driver at the wheel. A warning light shows on the dial at 50 m.p.h. or any other pre-set limit required. The charts can cover 1 day for local deliveries, or 7 days for long distance haulage.

The equipment is connected to the gear box by means of flexible couplings, and can replace or supplement an existing speedometer.

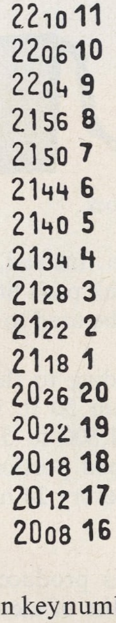
9. Watchman's Patrol Systems

These systems are designed to ensure that premises are regularly patrolled as a safeguard against fire and burglary. They can be categorised into two main groups: those requiring a portable clock to be carried by the patrolman, which contain a recording device, and those requiring only a key to be carried, the recording being made on a central recorder.

Portable Clocks

At predetermined positions in the premises to be patrolled are fixed stations. At each of these stations is situated a marking key, sometimes located for security in a special box. The patrolman carries the clock—preferably in a leather container—and at each station, inserts the key into an aperture in the clock case. A turn of the key produces a visual record in the form of a number, letter, or special mark, on the paper chart contained within the clock. These vary with the different systems. For example, some systems use circular charts printed similar in design to a spider's web, with time calibrations. This chart, which lays flat on a moving time drum, is either punctured or stamped by the insertion of the station key, and is renewed daily.

Another system uses keys engraved numerically and produces a record printed vertically on a ¾ in. wide roll of plain paper, of all stations visited and the time of each visit.

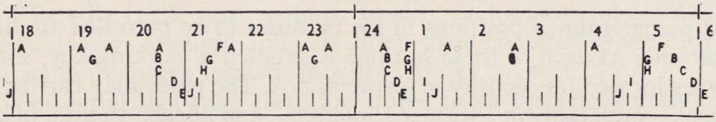


```
2210 11
2206 10
2204 9
2156 8
2150 7
2144 6
2140 5
2134 4
2128 3
2122 2
2118 1
2026 20
2022 19
2018 18
2012 17
2008 16
```

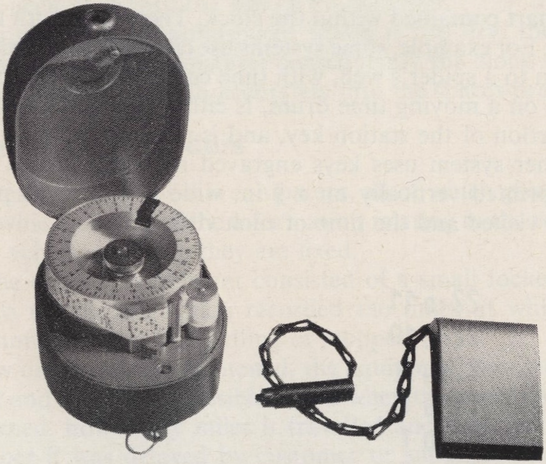
A vertical record produced by some types of watchman's clocks.

The station key numbers are sometimes printed in a different colour from the time. Both the ink ribbon and the paper roll are automatically moved along each time a stamping is made to prevent over-stamping.

In yet another system, a ¾ in. wide time calibrated paper chart is used, and this is moved by a rotating time drum. The station keys are engraved alphabetically in vertical banks of 5 and produce a horizontal form of record, showing locations visited, approximate time at any point, direction and speed of the patrol.



A horizontal record produced by some types of watchman's clocks.



One type of watchman's clock.

No ink ribbons are used with this system. Instead, the keys are inked from different coloured impregnated ink pads fitted inside the key station boxes. The different colours can be used to advantage by indicating the position of the station.

The length of the paper rolls vary according to the system and particular model of clock, and may be from 30 ft. to 90 ft. The number of stampings also varies between 1,500 to 5,000 approximately. It is necessary to remove the stamped portion of the tape periodically and this is normally done once every 24 hours.

Central Recording Clocks

With these systems the record of patrols is produced differently. Stations fixed at predetermined points, consist of electrical contact boxes, operated by means of a key, which is carried by the patrolman. Each contact box is connected to a recording clock by a simple wiring system.

The central recording mechanism consists of a marker for each contact box and a clock controlled revolving vertical drum chart.

The closing of the circuit by the operation of the contact box, records the visit by a mark on the chart, and the position of each mark indicates the location of the box and time of visit.

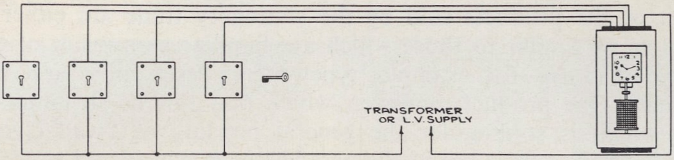


Diagram of wiring for a central recording watchman's clock system.

With this system, the central recorder can, if so desired, be inaccessible to the patrolman, thus obviating the possibility of interference. At the end of the patrol period a complete chart record is available for inspection which, according to the arrangement of the recorder, may cover a period from 12 to 72 hours.

CHAPTER 29

Charting and Planning Systems

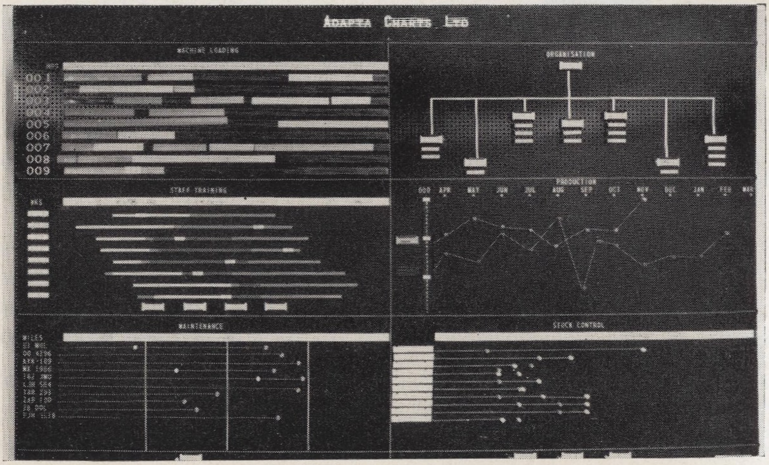
Most of the products sold by the stationery trade are either the same as or similar to those which are familiar as a result of their everyday usage—for example, typewriters, desks, pens and filing cabinets. One product, however, which may not be so familiar is that which is sold under the general heading of "wall charts." This is because their use in the past has been considered as for the specialist only.

Over the last few years, as a result of the increased speed and pressure of business activities and the shortage of staff, this attitude has changed, and the wall chart is now generally accepted as essential to the smooth and efficient running of a modern business.

1. Types

For all practical purposes there are six different types of wall chart.

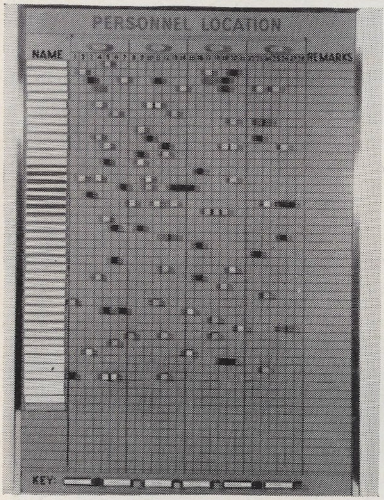
Perforated panel charts: These are panels with holes spaced at equal intervals into which specially designed plastic holders and coloured pegs can be inserted. Such charts usually incorporate the use of flexible coloured cords which can be extended across the face of the chart to show the progress of a series of jobs against a time-scale.



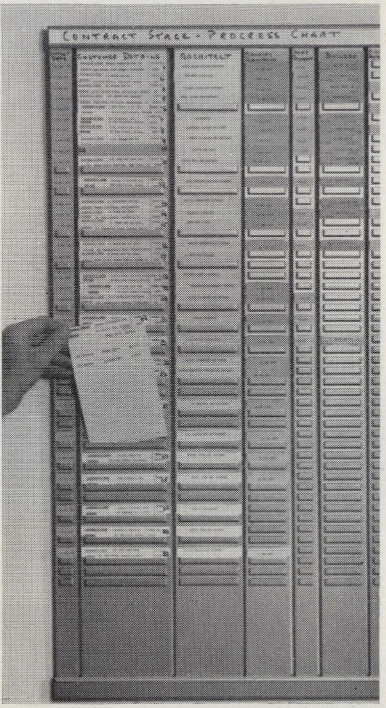
Perforated Panel Chart.

Magnetic charts: These are light-weight metal panels to which magnetic symbols and letters adhere. They have the advantage of being quick and easy to alter.

Channel charts: Charts of this type are made up of a number of metal or plastic channels or slots set in parallel lines on boards of varying size. Coloured cards are inserted into the channels or slots to plot various activities against a time or a quantity scale displayed across the top of the chart.



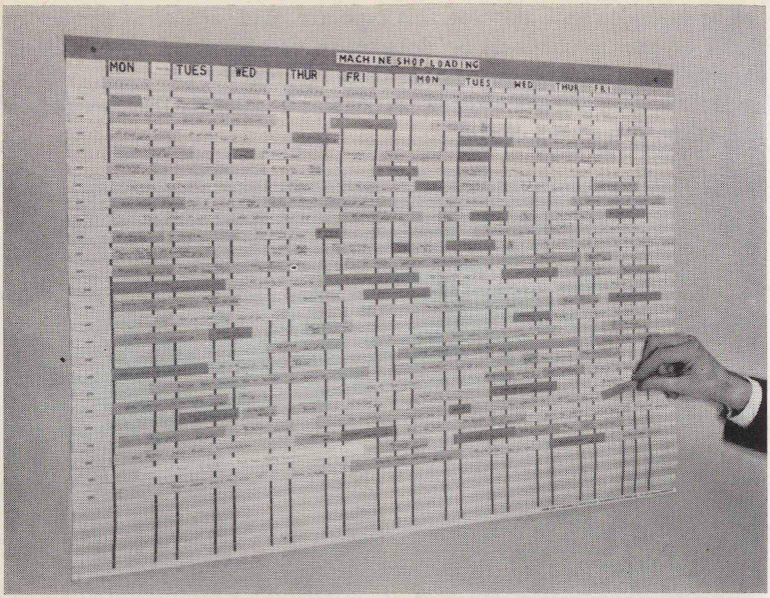
(*Above*) Magnetic Chart.



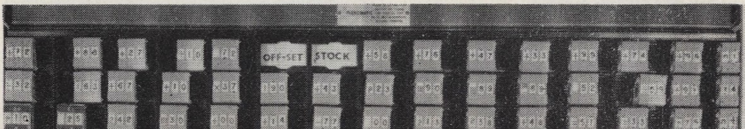
(*Right*) Card Rack

Card Racks: With these types of chart, card-holding devices usually numbering 48, are positioned at ½ in. intervals one above the other rather like the rungs of a ladder. "T"-shaped cards are inserted between the "rungs" leaving the top ½ in. of card visible. A complete chart may consist of a series of units each of 48 card-holding devices placed side by side in a common frame, the frame being so constructed that individual units can be removed and reinserted at varying positions along its axis. One advantage of the card rack system is the ease and speed with which the "T"-shaped cards can be switched from one part of the chart to another. It is an ideal method of planning a number of activities when space is not a major consideration.

Revolving Disc Charts and Figure Registers: Such charts consist of a series of small discs each of which is consecutively numbered from 0 to 9 round the circumference. Each disc is housed in a


MACHINE SHOP LOADING
MON
TUES
WED
THUR
FRI
MON
TUES
WED
THUR
FRI

Channel Chart.


OFF-SET
STOCK

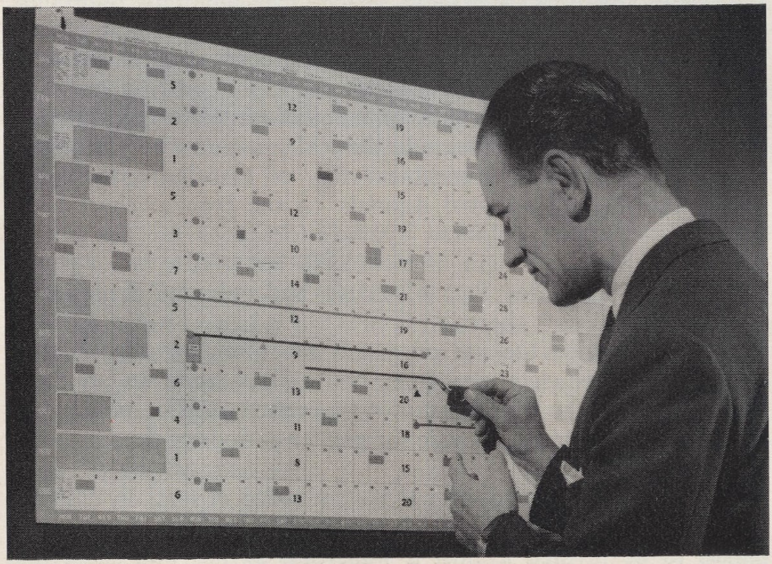
Revolving Disc Chart.

self-contained box with a small cut-out section in front which permits only one number to appear at a time. To change the numbers the disc is rotated vertically. Several of these boxes can be placed side by side with their cut-out sections next to each other so that any number of digits can be displayed.

This type of chart is generally used for stock control when quick alterations to figures are required.

The same method can be used to produce **Bar Charts** (*i.e.*, charts consisting of lines of coloured bars) but for this purpose the numbers are replaced by different coloured segments.

Plastic Laminated and Gridded Charts: Such charts are available with a range of printed rulings and laminated with a transparent film which protects the chart and provides a surface to which special self-adhesive coloured signals, tapes and transparent plastic channelling can be applied for indicating whatever activity the user wishes. The range of plastic laminated charts also includes one printed with every day of the year. These charts are widely used for forward planning of various activities.



Plastic Laminated Chart.

Many of the charting systems referred to above are only supplied direct to the consumer by charting specialists. However, the plastic laminated type of chart is finding increasing favour among stationers because of its simplicity, adaptability and the fact that the makers supply pre-packed kits of parts for solving the majority of charting problems.

2. Basic Requirements

Because many stationers regard charting problems as a comparative innovation, they are apprehensive about dealing with them. A very brief study of this subject will show that in the majority of cases "chartists" have the same basic requirements and, once these have been mastered, advice on all types of planning problems can readily be given with confidence. In fact, it will be found that one is involved in dealing with a very interesting facet of industry and quickly becomes an authority on matters which hitherto have been the province of the research specialist.

The main basic requirements of most charting problems are:

(1) A "title column," usually displayed on the left of the chart;

(2) A "scale," usually displayed across the top of the chart.

Into the title column such information as job numbers, customers' names, items of stock, etc. are inserted. The scale used will depend on the type of problem in hand. For example, a stock-control chart will require a quantity-scale, a job progress chart a time-scale. The quantity-scale can be in digits, dozens, tens, hundreds, thousands, etc., and the time-scale can be in minutes, hours, days, weeks, months, etc. Occasionally a problem will require a combination of both a time-scale and a quantity-scale.

As the object of all charts is to enable the user to quickly relate information in the title column to the scale, it is now only necessary to decide on the most convenient way of associating these two items. The method adopted depends on the type of chart being used—for example, coloured symbols or tapes on the plastic-laminated charts, a length of elasticated coloured cord or plastic pegs on the perforated type of charts, and coloured cards in the channel or card rack charts.

Charts involving the use of panels are often manufactured to a basic unit (which varies from one manufacturer to another). They are usually so designed that two or more panels can be placed alongside each other to provide for greater periods of time or larger quantities etc.

A recent innovation has been the introduction of specially designed frames and wall brackets which will enable up to a dozen chart panels to be pivoted against a wall, thus saving wall space and providing greater convenience for any user who may have a number of problems which he wishes to keep close to his desk.

3. Selling Points

A frequent comment made by those who need a chart but who are not familiar with the latest systems available is "A chart takes too long to keep up to date." This is more often than not an excuse

Swivel Type Frame Unit.

which hides a dislike of having to think out a problem in the first place.

In any case, a chart should be kept as simple and uncomplicated as possible or it may fall into disuse because the person responsible for keeping it up to date, or the person requiring the information that it provides, finds it too complicated to be reliable.

When advising customers on the most suitable type of chart to use, stationers should bear in mind that it must be adaptable to changing circumstances. Otherwise, a chart which is satisfactory when purchased may be useless within a short space of time.

The essential points to be borne in mind in the selling of chart systems may be summarized as follows:

Purpose: It should be established as quickly as possible what it is the customer wishes to chart, as from this information a decision can be reached on the type of chart and scale required. Some chart manufacturers provide kits of component parts specially designed for specific purposes. These kits contain all the accessories required to solve the problem for which they are designed and eliminate the need for lengthy discussion.

Ease of Alteration: To be of any value, a chart must be kept up to date. For this reason it is wise always to recommend a system that is easy to use and to alter.

Simplicity: If the amount of information being put on to a chart becomes too confusing it loses its purpose; therefore it should be kept simple.

Adaptability: The situation being planned today may vary considerably from the position at some future date. Therefore a charting system should be advocated that can be readily adapted to accommodate changing circumstances.

Extension of System: Wherever possible it is desirable to recommend a charting method that is suitable for solving as wide a range of problems as possible. This will encourage an extension of the use of the "system" to other departments in the same organization, as all concerned will be familiar with it.

Information by Colour, Words, Figures or Shapes: One of the main objects of a chart is to provide the user with information at a glance. Therefore colours and/or shapes should be used to indicate activities, as these convey more than the written word, which must be read before it is understood.

Portability: It is frequently necessary for charts and plans to be presented at meetings remote from the office in which they are normally used. Because of this, light-weight charts are an advantage. Light-weight charts are also an advantage where it is necessary to display a number of charts in a confined space, as some types can be supported in groups from swinging frames or even suspended from specially designed free-standing units.

4. Applications

Because the needs of the user can be wide and varied, it is quite impossible to detail all the applications of charting systems. However, the following groups comprise the more important and most popular applications.

Graphing: This is one of the most elementary forms of visual control. It is also one of the most important aids to planning by charts. All that is required is a suitably columned chart with a quantity-scale affixed vertically on the left-hand side and a week, month or year scale across the top. Narrow self-adhesive coloured tapes are ideal for marking out the path of the graph, and self-adhesive dots help to make the peaks and troughs more apparent.

A horizontal line can be used to show average figures relating to previous periods, and the relationship between present and past figures can thus be seen immediately.

Programming, Progressing and Scheduling: For charts of this type the following points must be borne in mind:—

(1) Index column on left.

(2) Time (or date) scale across top of chart.

(3) Cards, cut to represent length of time each job planned to take, appropriately placed on chart.

Such operations as machine loading, workshop loading, job progress, production control, exhibition programming, punched card programming, advertisement scheduling, staff holiday planning, staff training, etc. can be effectively controlled in this way.

If a quantity-scale is substituted for the date-scale, this same layout can be used for such problems as budget control and vehicle maintenance.

Removal Section Charts that can be "Rotated" according to the Period in use.

Floor Layout Planning: For this type of chart a suitably scaled base will be required (one sub-divided into $\frac{1}{4}$ in. or $\frac{1}{8}$ in. squares is most effective). Narrow self-adhesive coloured tapes can be used to show the layout of the area, and coloured plastic shapes can be cut to represent the fixtures and fittings to be positioned within the area. With such charts, the best possible use is made of available space and the most efficient staffing arrangements catered for.

CHAPTER 30

Safes and Fire-Resistant Equipment

1. Security and Selling

The security that is offered by safes, whether it be to prevent damage by fire or entry by burglars, is dependent on a large number of factors. For instance, the value of the contents must be taken into consideration, the environment of the building may have a large bearing on the matter, the location of the safe within the building is obviously relevant and the accessibility of the building itself wants looking at. All this is on the assumption that no other security precautions have been taken.

Having determined the above points it is still not easy to recommend a suitable safe without a fair knowledge of its construction, and possibly of the insurance company's requirements.

In selling security everyone has a moral obligation to sell the right safe for the risk. It is pointless to sell a safe not capable of doing what is required of it—*i.e.*, by selling cheap. It is also pointless to sell a safe better than that which is required, unless expansion in risk is envisaged: over-selling never helped anyone.

No reputable manufacturer will offer a "burglar proof" safe, for "anything that is man-made can be man-destroyed," but the range of resistance is legion, and the best way of evaluating resistance in terms that can be easily understood is by converting it into "time." In other words, it is a question of selling time, and each safe will take a certain amount of time to open or to have its contents destroyed by heat. This resistance, measured in hours, is still not an easy scale to relate to any particular constructions, because again environmental aspects have to be considered.

If a potential customer goes into a shop and asks to buy a fountain pen, the retailer shows him the range in stock and can let the customer choose without more ado, except to inquire as to the type of nib required. In other words, the customer usually can be expected to know enough about pens to make up his own mind; if he finds that he has chosen the wrong one he could buy another, as the price is not an item likely to require more than serious consideration. In the case of security equipment, the price prohibits the purchaser from just going out and buying another if it is thought not to be suitable and the customer knows nothing about safes. It is therefore up to the retailer to recommend, and to help the customer to choose, the right safe for the job.

The retailer, in fact, cannot be expected to understand all the security risks involved nor to survey the premises in order to give a more accurate evaluation of these risks. Neither can he be expected to carry a stock of safes ranging from, say, 2 cwt. to 4 tons.

In the security field the retailer should act as a go-between so that he can pass on inquiries to the manufacturer and let the latter take up the assessment of the risk and offer the appropriate piece of equipment.

Some retailers do, of course, possess the necessary knowledge to undertake this type of work, but specialization does not appeal to everyone.

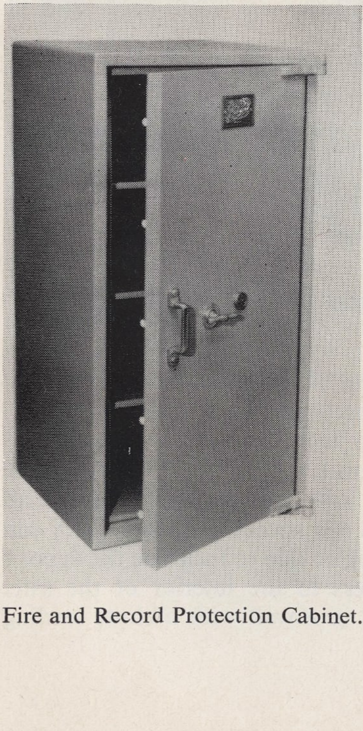
2. Qualities

In a handbook of this type generalization would be a hindrance rather than a help, for even books devoted to security alone have not been able to illustrate a fraction of the situations that can occur. However, let it be said that safes and fire cabinets are divided into different qualities, these being:

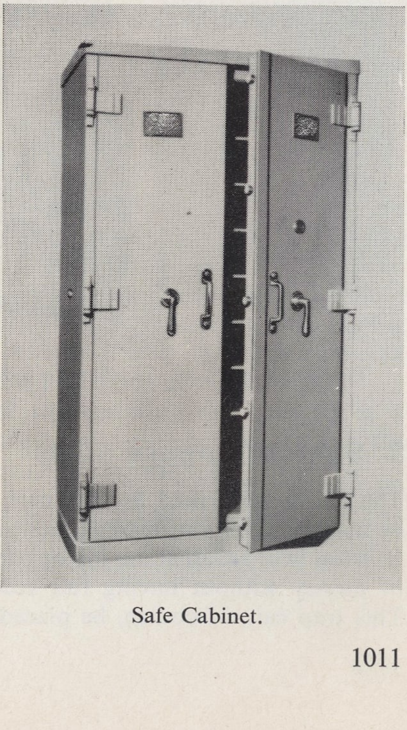
(a) **Fire and record protection cabinets** for general purposes.

(b) **Safe cabinets** for special fire risks and the housing of microfilms, computer tapes and papers which, while of no value in themselves, would be of irreplaceable value to the owner and must be given the best protection from the fire hazard.

(c) **Safes for the protection of valuables.**



Fire and Record Protection Cabinet.



Safe Cabinet.

In this category the range increases in strength:—

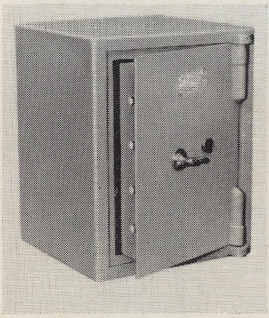
(1) The fire-resisting safe also gives some protection against the inexperienced thief and may be covered for small amounts of cash by an insurance company.

(2) The next category is a safe capable of resisting fire and fall. Fall in a fire is a hazard in itself and, if a safe is built to withstand a fall, its inherent strength is increased. Accordingly its thief-resisting properties also increase, although not by a great deal, as thickening of material does not always increase resistance to attack. For example, a $\frac{1}{4}$ in. mild steel plate is not all that more difficult to drill than a $\frac{1}{8}$ in. mild steel plate.

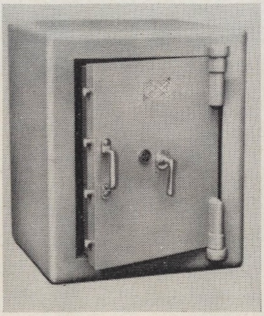
(3) The burglar-resisting safe now starts to show itself: this is usually fitted with an anti-explosive bolt. At this point the fire-resisting properties of a safe do not normally change, but of course the fall resistance is always increased as body thicknesses increase.

(4) The next safe usually has a highly drill-resistant door protecting the bolt mechanism from this form of attack.

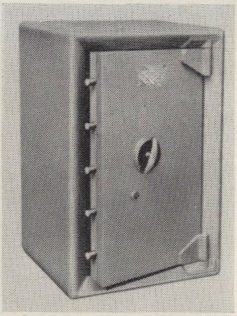
(5) Lastly, the anti-blowpipe and oxy-arc-resisting safe is reached, but even here there may be as many as five qualities, each giving a greater resistance in terms of time than its predecessor and each therefore being designed to take more valuable contents or to be placed in a more exposed position.



Fire-Resisting Safe.



Burglar-Resisting Safe.

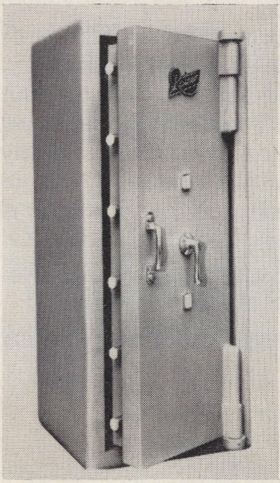


Light Anti-Blow Pipe Safe.

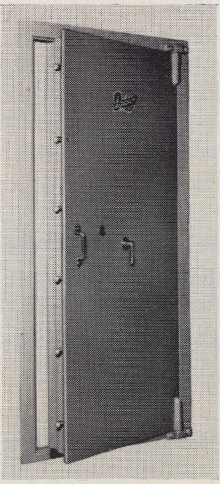
3. Special Purpose Safes

The above-mentioned fire cabinets, safe cabinets and safes can all be made in their various qualities to suit special purposes. They can be fitted with a trap at the top or back or side to facilitate the deposit of money without having full access to the interior of the safe. This trap can, of course, be placed in a wall with a chute leading from the trap into the safe. The trap door would be of the same quality as the safe, so that proportionally the whole unit gives the same amount of security.

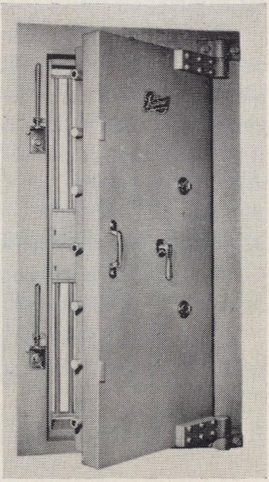
Wall safes are produced usually for home protection or, in some cases, commercially where security is required for keys, or again for small amounts of cash. The wall safe in itself obviously cannot give very much more security than the wall into which it is placed, and concealment of a wall safe is therefore very often its best protection. This applies equally to a floor safe, which is somewhat on the same principle.



Heavy Anti-Blow Pipe Safe.



Light Fire-Resisting Door.



Heavy Anti-Blow Pipe Door.

It may well be of interest to note that strongroom doors are produced in very nearly the same ranges as safes, varying from the light fire-resisting to the heavy anti-blowpipe, oxy-arc-resisting door. One point to remember here is that the door placed in the wall should obviously be comparable to its wall—*i.e.*, there is no point in placing a heavy door in a light wall, or vice versa. It must also be remembered that the ceiling must give the same protection as the walls.

In conclusion it is important to remember that security is a specialized business and that one should not hesitate to ask the manufacturer for help, guidance and information.

British Standards

1. British Standards Institution

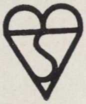
The B.S.I. is the recognised body in the United Kingdom for the preparation and promulgation of national standards covering *inter alia* terms, definitions and symbols; methods of test; specifications for quality, performance or dimensions; preferred sizes and types; codes of practice.

The principles observed in the preparation of British Standards are that they should be in accordance with the needs of industry, should meet a generally recognized demand and take into account the interest of producers and users. British Standards are prepared under the guidance of representative committees and are widely circulated before they are authorized for publication. They are periodically revised. Work in international standards bodies is guided by the appropriate B.S.I. committees.

The structure of councils and committees is laid down in Byelaws.

A booklet (PD4854) giving details of the organization and working of B.S.I. is available free of charge.

2. The British Standards Mark



The British Standards Mark (popularly referred to as the 'Kite' mark) is a registered certification trade mark owned by the B.S.I., which may by licence permit manufacturers to use the mark on their products when their quality control arrangements are considered satisfactory and they have agreed to comply with a Scheme of Supervision and Control involving a routine of inspection, sampling and testing appropriate to the particular product. The mark is thus an independent assurance to the purchaser that these products are produced and tested in accordance with the requirements of the relevant British Standard. The B.S.I. is advised on policy in relation to marking by the Certification Mark Committee. A list of manufacturers holding licences to use the Mark is available on request.

3. References of British Standards

The following list of publications, are those standards from which information has been reproduced wholly or in part (indicated thus*), or to which a brief reference has been made. Others, such as glossaries, have been included as being of special interest, and the remainder for reasons of relevance, or particular interest.

Of necessity, it is an abridged and restricted list. Furthermore, amendments, revisions and new standards are constantly being published. *It is important, therefore, that users of British Standards should ascertain that standards are published relating to their requirements, and that they are in possession of the latest amendments or editions.*

Full information of all standards, amendments and revisions, may be found in the B.S.I. Yearbook, which includes a subject index and abstract of every British Standard published. The Yearbook Supplement lists and describes international publications, together with particulars of their relationship to British Standards. Sectional Industry Lists are also available (free of charge) from B.S.I. Sales Branch, Newton House, 101 Pentonville Road, London, N.1.

Indication of standards published in metric units, or otherwise, is made as follows:—

M	Standards in which the requirements are specified only in metric units (in some instances, approximate imperial conversions are included).
M + I	Standards in which the requirements are specified in both metric and inch units, either system being used exclusively to produce the required result.
N	Standards which by their nature are independent of any system of units, *e.g.*, colour codes and glossaries.

Standards not coded are still expressed in imperial units; they generally include approximate metric equivalents.

Chapter 2

*1360 : 1961	Personal stationery.	
*1411 : 1947	Printers' cards and blanks (terms and sizes). (Confirmed 1954.)	

Chapter 4

2780 : 1956	Glossary of leather terms.	N

*1133: —	Packaging code.	
	Section 1–3:1967 Introduction to packaging.	
	Section 7:1967 Paper and board wrappers, bags and containers.	
	Section 13:1954 Twines and cords for packaging.	
	Section 14:1961 Adhesive closing and sealing tapes.	
	Section 16:1953 Adhesives for packaging.	
*1466:1967	Tie-on tag labels.	**M**
1677:1959	Draughtsmen's drawing pins.	
2570:1962	Natural fibre twines.	
2726:1956	Marking inks.	
2729	Comprising:—	
	2726 Marking inks for stock purposes.	
	2727 Marking inks for domestic purposes.	
	2728 Marking inks for laundry and dry cleaning purposes.	
	2729 Marking inks for dark coloured fabrics.	
2766:1956	Moulded plastics ash trays.	
3047:1958	Sizes of posters.	
3060:1958	School chalks.	
3130:1959	Glossary of packaging terms.	
3484:1962	Blue-black record inks.	
3657:1963	Blue-black writing inks.	
3695:1963	Polythene monofilament twines.	
3721:1964	Blue-black inks for fountain pens.	
3802:1964	Washable inks for fountain pens.	
3803:1964	Red inks for general writing purposes.	
3887:1965	Regenerated cellulose and unplasticized P.V.C. pressure-sensitive closing and sealing tapes.	**M + I**
4035:1966	Linear measuring instruments for use on building and civil engineering construction work. Steel measuring tapes, steel bands and retractable steel pocket rules.	
4093:1966	School rulers.	**M + I**

Chapter 6

*1133: —	Packaging code. Section 7:1967 Paper and board wrappers, bags and containers.	
1340:1960	Prepared and natural tracing paper.	
1342:1962	Detail drawing paper.	
1343:1962	Cartridge drawing paper.	
3203:1964	Glossary of paper, stationery and allied terms.	N
*4000:1968	Sizes of paper and board.	M

(*A number of standards relating to methods of testing paper, are also published.*)

Chapter 7

*1133: —	Packaging code Section 7:1967 Paper and board wrappers, bags and containers.	
*1891:1965	Sizes of single-ply paper bags.	
3043:1958	Storage envelopes for processed X-ray films.	
4264:1967	Envelopes for commercial, official and professional use. (Terms and sizes).	

Chapter 8

*1544:1949	Bound account and manuscript books (other than scholastic books).	
*3327:1961	Stationery for quantity surveying.	

Chapter10

1000C:1963	Guide to the Universal Decimal Classication.	N
*1467:1957	Dimensions of folders and files for correspondence filing.	
1749:1951	Alphabetical arrangement.	N

Chapter 11

*1219:1958	Recommendation for proof correction and copy preparation.	N
1311:1955	Sizes of manufacturers' trade and technical literature (including recommendations for contents of catalogues).	
2489:1954	Sequence of measurements for printed matter (including advertisements and printing plates).	N

*2961 : 1967	Typeface nomenclature and classification.	N
3814 : 1964	Glossary of letterpress rotary printing terms used in connection with newspaper, magazine and similar machines.	N
4149 : 1967	Glossary of paper/ink terms for letterpress printing.	N
4277 : 1968	Glossary of terms used in offset lithographic printing.	N

(*A number of standards, principally of concern to printers are also published. See also Chapter 23.*)

Chapter 12

2808 : 1956	Artists' water-colour brushes for local authorities.	
2876 : 1957	Powder pigments for artists' use.	N

Chapter 13

1265 : 1958	Drawing boards and tee squares.	
1268	Comprising:— 1265 Engineers' pattern drawing boards. 1266 Engineers' pattern tee squares. 1267 Students' clamped drawing boards. 1268 Students' tee squares.	
1340 : 1960	Prepared and natural tracing paper.	
1342 : 1962	Detail drawing paper.	
1343 : 1962	Cartridge dfawing paper.	
1347 : —	Architects', engineers' and surveyors scales. Part 1 : 1956 Boxwood scales. Part 2 : 1959 Plastic scales.	
1709 : 1958	Drawing instruments for drawing office use.	
2457 : 1954	Protractors for drawing office use.	
2458 : 1954	French curves for drawing office use.	
2459 : 1954	Set squares for drawing office use.	
2490 : 1954	Waterproof drawing inks.	
3429 : 1961	Sizes of drawing sheets.	M + I
3459 : 1962	Drawing office drafting stands.	
4188 : 1967	Compasses for use with pencils in schools.	M + I

Chapter 14

* 826 : 1955	Adjustable steel shelving (angle post type).	
3044 : 1958	Anatomical, physiological and anthropometric principles in the design of office chairs and tables.	N
3079 : 1959	Anthropometric recommendations for dimensions of non-adjustable office chairs, desks and tables.	
3404 : 1961	Anthropometric recommendations for dimensions of office machine operators chairs and desks.	
3437 : 1961	Equipment for the filing of drawings.	
3460 : 1962	Draughtsmen's chairs.	
3478 : 1962	Drawing office reference tables and benches.	
3893 : 1965	Office desks, tables and seating.	
4141 : 1967	Industrial seating.	

Chapter 15

*2481 : 1961	Typewriters.

Chapter 16

1568 : 1960	Magnetic tape for sound recording.
*3738 : 1964	Dictation machines.

Chapter 17

*1909 : 1963	Adding machines.

Chapters 19 and 20

3174 : 1959	Alpha-numeric punching codes for data processing cards (nominal size $7\frac{3}{8}$ in. × $3\frac{1}{4}$ in.).	
3480 : 1962	Data processing codes for punched tape.	N
3527 : 1962	Glossary of terms relating to automatic data processing.	N
3560 : 1962	Stationery feeding mechanisms for line-at-a-time high speed printers.	
3635 : 1963	Codes for punched tape for numerically controlled machine tools.	N
3658 : 1963	Magnetic tape for automatic data processing.	
3732 : 1964	Precision spools for data processing magnetic tape.	
3880 : 1965	The dimensions of punched paper tape for data processing.	

Chapter 21

*1808: —	Sizes and recommended layouts of commercial forms.	
	Part 1:1963 Forms other than continuous stationery.	
	Part 2:1967 Continuous stationery (for general office use).	
3723:1966	Dividend and interest warrants and related tax vouchers.	
4126:1967	Cores and spools for carbon, hectograph and fabric ribbons.	**M**

Chapter 23

1112:1962	Sizes of photographic paper for general use.	**M + I**
1153:1955	Recommendations for the storage of microfilm.	
1359:1947	Photographic conversion tables.	**M + I**
1371:1956	Microfilm, readers and reels.	
1406:1960	Sizes of sensitized photographic plates.	
1772:1951	Sizes of photographic sheet film (other than X-ray film).	**M + I**
*1896:1960	Sizes of sensitized materials for document reproduction.	**M + I**
3206:1960	Sizes of photographic papers for roll-head printers.	
3822:1965	Sizes of sensitized photographic colour materials (sheets, machine rolls and bulk rolls) used in reversal and negative/positive processes.	
4187:1967	Microfiches.	**M**
4189:1967	Conventional typographical characters. for legibility tests.	**M**
4191:1967	Essential characteristics of 35 mm. microfilm reading apparatus.	
4210: —	35 mm. Microcopying of engineering drawings and associated data.	
	Part 1:1967 Recommended procedure.	**M**
4212:1967	Guide to the selection of processes for reproducing drawings.	

(*There are also many standards published relating to photography and photographic equipment*)

Chapter 26

204 : 1960	Glossary of terms used in telecommunication and electronics.	N
CP327 : —	Telecommunication facilities in building.	
	Part 3 : 1964 Sound distribution systems.	
	102 : 1952 Telephones and telegraphs (Private services).	
	401 : 1952 Bell and call systems.	
	402 : 1951 Staff location systems.	

(*Very many standards are published relating to telecommunication and associated equipment*)

Chapter 28

CP327 : —	Telecommunication facilities in buildings.	
	403 : 1952 Impulse clock and timing systems.	

General

350 : —	Conversion factors and tables.	
	Part 1 : 1959 Basis of tables. Conversion factors.	M + I
	Part 2 : 1962 Detailed conversion tables	M + I
3681 : —	Electrical safety of office machines.	
	Part 1 : 1965 General requirements and tests for earthed equipment.	
	Part 2 : 1968 Requirements and tests for machines presenting special hazards.	
PD6245 : 1967	Going metric—first stages.	
PD6286 : 1967	Metric Standards—published and in progress.	

(*Other standards are also available concerning metrication and conversion*)

Bibliography

No attempt has been made to prepare an exhaustive bibliography. However, those readers requiring additional or more detailed reference in pursuance of their studies, will find the following publications informative and of interest.

Generally, most subjects are represented—some more so than others. A few have defied attempts to find suitable titles. Consistent with the aims and objects of this manual, the endeavour has been to restrict the selection, wherever possible, to books without a highly technical or too specialized content. Some titles are included for what they say about stationery, office equipment, etc., or because they are considered useful references to commercial and business practice.

Deliberately, and with few exceptions, the choice has been made from books published or revised in recent years. All are in print at time of going to press. It should be noted, however, that no adverse opinion is implied by exclusion of other titles in print, or now out of print and consequently available only from libraries. In point of fact, those with time to spare for browsing in a bookshop or library will find considerable material of interest.

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